PROCEEDINGS OF THE

AMERICAN PHILOSOPHICAL SOCIETY.

HELD AT PHILADELPHIA, FOR PROMOTING USEFUL KNOWLEDGE.

VOL. IX. No. 71.

CONTENTS.

January 1, 1864. PAGE

Election of Officers 290
On the Height of the Tides. By P. E. Chase 291
On the Danish Element in England. By H. Coppee . . . 294

January 19, 1864.

On the Family as an Element of Government. By E. K. Price . 295
Appointment of Committees 328

February 19, 1864.

An Obituary Notice of Dr. W. Darlington. By T. P. James . . 330

March 4, 1864.

Catalogue of Scientific Memoirs by the Royal Society . . . 344
On Barometric Fluctuations and Temperature. By P. E. Chase . 345

March 18, 1864.

On the County Maps of the United States by R. Pearsall Smith, . 350
Transfer of Cabinet Specimens 353

April 1, 1864.

On Heat and Muscular Energy. By P. E. Chase 355
On the Manufacture of Paper Pulp from Wood. By R. Briggs . 360
On the New Flax Fibre Machine. By Dr. Emerson . . . 360
On the Hundredth Voyage of the Canada. By J. P. Lesley . . 360

April 15, 1864.

On Magnetic Currents. By P. E. Chase 367
On Stone Implements. By F. Peale. (See page 401.) . . 371
Election of New Members 371

May 6, 1864.

Letter of Professor Zantedeschi 372

May 20, 1864.

Catalogue of Books, deposited by J. L. Leconte 377
Synopsis of Paper on the Influence of Ether in the Solar System.
By Alex. Wilcocks 384
On the Abbeville Quarries. By J. P. Lesley 388

June 17, 1864.

On the Effects of Rotation upon the Barometer. By P. E. Chase . 395
On the Ancient Sea-Level. By J. P. Lesley 399

Mr. Durand then obtained permission to read an obituary notice of the late Dr. Short, of Louisville, prepared by Dr. Gray, of Cambridge, Mass. Mr. Durand stated that the admirable Herbarium of Dr. Short would be deposited in the Academy of Natural Sciences in Philadelphia. On motion of Mr. Durand, Dr. Gray was appointed to prepare an obituary notice of the late Dr. Short, for this Society.

The Finance Committee presented their annual report, and recommended the following appropriations to be made for the coming year, which on motion was accordingly done, viz.:

Journals,	$50
Hall,	600
Binding,	100
Publication,	800
Salary of Librarian,	700
Salary of Assistant,	360
Salary of Janitor,	100
Petty expenses of Library,	50
Insurance,	200
General expenses,	500
	$3,460

New nominations Nos. 506, 507, were read.

And the Society was adjourned.

Stated Meeting, January 1, 1864.

Present, seventeen members.

The judges and clerks of the annual election held this day, reported the following officers as duly elected:

President.

George B. Wood.

Vice-Presidents.

John C. Cresson,
Isaac Lea,
George Sharswood.

Secretaries.

Charles B. Trego,
E. Otis Kendall,
John L. Le Conte,
J. Peter Lesley.

Curators.

Franklin Peale,
Elias Durand,
Joseph Carson.

Members of the Council for Three Years.

Alfred L. Elwyn,
John Bell,
Henry Coppée,
Oswald Thompson.

Treasurer.

Charles B. Trego.

Photographic portraits of Dr. Hyrtl and Dr. Rokitansky, of Vienna, and of Dr. D. Francis Condie, of Philadelphia, were presented to the Society.

Donations for the Library were received from the Royal

Astronomical Society, the Essex Institute, the Franklin Institute, Dr. Roehrig, and Prof. A. D. Bache.

The death of Lewis Waln, a member of the Society, on the 20th ult., aged 68, was announced by Prof. Trego, and Prof. Cresson was appointed to prepare an obituary notice of the deceased.

Mr. Chase made a communication, in relation to the height of the tides, as connected with atmospherical phenomena, and the diurnal and annual motions of the earth.

The following table furnishes material for many instructive comparisons, some of which deserve special notice on account of the additional confirmations that they furnish to the rotation theory. The column headed "Observed Height of Barometer," gives the grand mean of three years' observations at St. Helena: A represents the theoretical height as computed by our formula; B introduces such modifications as would result from assuming the mean of the equatorial observations as a normal equatorial altitude.

TABLE OF MEAN BAROMETRICAL RESULTS, THEORETICAL AND OBSERVED.

Time.	Ratio of observed heights.	Observed height of bar 28 in. +	Theoret. height A 28 in. +	Error A.	Theoret. height B 28 in. +	Error B.	Diff. of Errors.
0 h	1·00060	·2985	·2970	—15	·3002	17	—32
1	1·00000	·2819	·2821	2	·2821	2	0
2	·99945	·2660	·2672	12	·2640	—20	32
3	·99905	·2553	·2563	10	·2507	—46	56
4	·99894	·2521	·2523	2	·2458	—63	65
5	·99908	·2562	·2563	1	·2507	—55	56
6	·99938	·2642	·2672	30	·2640	— 2	32
7	·99982	·2764	·2821	57	·2821	57	0
8	1·00028	·2899	·2970	71	·3002	103	—32
9	1·00065	·3003	·3079	76	·3135	132	—56
10	1·00086	·3061	·3119	58	·3184	123	—65
11	1·00074	·3025	·3079	54	·3135	110	—56
12	1·00033	·2913	·2970	57	·3002	89	—32
13	·99988	·2777	·2821	44	·2821	44	0
14	·99938	·2646	·2672	26	·2640	— 6	32
15	·99908	·2562	·2563	1	·2507	—55	56
16	·99905	·2550	·2523	—27	·2458	—92	65
17	·99926	·2611	·2563	—48	·2507	—104	56
18	·99973	·2737	·2672	—65	·2640	—97	32
19	1·00028	·2898	·2821	—77	·2821	—77	0
20	1·00081	·3048	·2970	—78	·3002	—46	—32
21	1·00120	·3163	·3079	—84	·3135	—28	—56
22	1·00130	·3184	·3119	—65	·3184	0	—65
23	1·00107	·3117	·3079	—38	·3135	18	—56

It will be seen that the purely theoretical height A corresponds more nearly with the observations than the mixed height B. It is therefore evident that there is a slight disturbance (which may perhaps be owing either to variations of temperature, or to a resisting medium), which follows a different law from the principal disturbance.

The changes are least near the times of high and low tide, and greatest midway between the two tides. If we compare the average high and low tides, we see that the observed height is somewhat less at high tide, and somewhat greater at low tide, than theory would give. These results would naturally follow from the combined fluidity and gravitation of the air.

From 1h. to 15h. inclusive (during most of which time the radius vector of each particle of air is increasing), the observed height of the barometer is less than the theoretical height.

From 16h. to 0h. inclusive (radius vector diminishing), the observed height is greater than the theoretical height.

The greater pressure before noon than before midnight, is precisely the result which would follow from the passage of the earth through a resisting medium, but it is directly opposed to the supposed tendencies of varying temperature.

The apparent difference in the laws that govern the aerial and ocean tides may be partially, if not wholly, accounted for by considering the difference of constitution in the two media, and the relative positions of the observer. The air is highly elastic and compressible, while water is cohesive and incompressible; the observer is placed underneath the atmosphere, but above the ocean. The air can therefore readily yield to any expanding or condensing force, without much perceptible motion, while a similar force applied to water would produce motion in the direction of least resistance; any force that tends to throw fluids away from any given portion of the earth, produces a high aerial tide, but a low barometric tide, and after some interval a high oceanic tide.

The frequent coincidence of high water with a low barometer, has been noticed by many observers, and it is strikingly presented in the comparative drawings given by Lubbock, in his Theory of the Tides. The prompt effect of rotation, combined with the retardation of the cumulative action which produces the lunar tides, may perhaps account for the errors of theory in Lubbock's Table of the

SEMI-MENSTRUAL INEQUALITY AT LONDON.

Apparent solar time of moon's transit h.		Height.		
		Theory.	Observation.	Error.
h.	m.	feet.	feet.	feet.
0	30	22·72	22·72	0
1	30	22·54	22·44	+·10
2	30	22·07	21·92	+·15
3	30	21·36	21·14	+·22
4	30	20 55	20·23	+·32
5	30	19·83	19·57	+·26
6	30	19·56	19·55	+·01
7	30	19·93	20·26	—·33
8	30	20 69	21·15	—·46
9	30	21·49	21·89	—·40
10	30	22·16	22·42	—·26
11	30	22·59	22·70	—·11

The regular recurrence of the aerial tides at stated hours, is a sufficient evidence of their dependence upon the relative positions of the earth and sun. Though the differential effect of the moon's attraction is greater than that of the sun's, the intensity of the solar attraction is much the greater. I am inclined to believe that this intensity is manifested in a greater stability of the solar attraction-spheroid, which prevents its yielding readily to the effects of rotation.

Lubbock quotes from Williams's Narrative of Missionary Enterprises, p. 172, his remarks on the "well-known fact that the tides in Tahiti and the Society Islands are uniform throughout the year, both as to the time of the ebb and flow, and the height of the rise and fall; it being high water invariably at noon and midnight, and low water at six in the morning and evening. The total range from low to high water seldom exceeds eighteen inches or two feet." The earth's rotation, producing an alternate half-day's acceleration and retardation in the eastward motion of the water, should create a tendency to tides of this character, and the situation of the islands mentioned, is peculiarly favorable for the development of that tendency. Were they near a continent or at the entrance of a gradually narrowing ocean, they would feel the influence of the derivative tide which accumulates the attractive energies of the moon for several successive transits, and the tides would vary with the moon, as upon our own shores: but the nearly uninterrupted ocean sweep of 80° to the eastward may give the combined rotation and solar waves such resistless force, that they can easily overcome the weak intensity

of the lunar attraction. If this hypothesis is confirmed by more accurate observations, the theory of Galileo will not only help us in our explanations of the aerial tides, but it will also lead to the recognition of a most important element in the ocean tides.

Prof. Coppée suggested that the subject of the "Danish Element in England," was worthy of the attention of the Society, describing the traces, still obvious, of the original Celtic and Teutonic occupation of the island. Dr. Washburne spoke of the northern English types, as existing in New England, and were deserving of farther study. Dr. Coates referred to the translation, by early emigrants, of old english names of places to the new localities in New England, which the emigrants occupied; and made further observations upon the origin of human races. Mr. Chase referred to the alleged early settlement of America by the Northmen.

Professor Lesley was nominated Librarian for the ensuing year.

Pending nominations Nos. 506, 507, were read.

And the Society was adjourned.

Stated Meeting, January 15, 1864.

Present, eighteen members.

Dr. Wood, President, in the Chair.

A letter accepting membership was received from Dr. Theodore Schwann, of Liège.

A communication from Mr. H. Stephens, of London, was read, proposing to act as general book agent, in Europe.

Donations for the Library were received from Prof. Zantedeschi, the Hon. J. D. Baldwin, Messrs. Blanchard & Lea, and Mr. C. H. Hart.

Dr. Emerson communicated the following fact, respecting the propagation of atmospheric vibrations to great distances.

He was at a place in the State of Delaware, on the night of the great explosion at Yorktown, Va., and one hundred and fifty miles distant from that city. The windows of his house were shaken in so remarkable a manner, that he could assign no other cause, but that of the explosion of the Yorktown powder magazines. Prof. Cresson mentioned an instance of a similar nature, which had come under his own observation, and, apparently, confirming Dr. Emerson's views.

Mr. Price read part of a paper entitled, "The Family, as an Element of Government."

THE FAMILY AS AN ELEMENT OF GOVERNMENT.

"God setteth the solitary in families."—PSALM 68:6.

IT is with hesitation and misgiving that I bring this subject before you; fearing to detain your attention too long, and apprehensive that it may not be thought strictly appropriate for our discussion. That the subject most nearly relates to man and his well-being, and is to disclose the design of the Creator in regard to him, should not make it the less one, it seems to me, of philosophical inquiry and interest. And if from the physical we should rise, in our investigations, to the moral and social welfare of man, still the subject will retain all its philosophical fitness, and deserve our attention. Permit me, then, to confess at the outset that I cherish the design to do a moral good, in my limited ability, and the better to do it, I wish to borrow your prestige. I have thought that if you would listen with approbation, others will think it worth while to read, and that ideas deemed salutary to society, though familiar to you, may thus more favorably reach those to whom they are less known. I cannot promise you novelty, for in constantly observed human nature, law, and morals, there is not so much opportunity to discover anything new, as there is a duty to insist upon what is already known for our good; and as law and morals have for their object but to state and impress a sound rule of conduct in life, sound practical sense is the highest merit that a writer upon these subjects can hope to attain.

I am conscious of addressing some, who, as naturalists, are accustomed to study the nature and habits of living creatures lower in the scale of beings than man. These are studied with a laborious care, minuteness, and skill, and an exactness of classification, that is absolutely surprising to others who are differently occupied. And for

what is all this self-sacrificing patience of intellectual labor? Chiefly but to gratify a scientific curiosity, and to penetrate into the intents and wisdom of the Creator, as displayed in his works. It is but to elevate and advance our views in the same course of study, to consider man in his domestic, social, and political relations; but with this higher interest, that it is to study our own nature and highest welfare.

It is when legislation grows out of human wants, and accords most closely with nature, that it is most useful and enduring. We begin, therefore, at the right point, when we study the nature and needs of man, with purpose to legislate for his welfare. I propose, in this discourse, that we shall consider the human family, that we may duly estimate its importance as an element of government, and consider how much it should be favored by our personal influences, by judicial decision, by legislation, and in all our social regulations.

To sketch the history and formation of the family, is to go back to the origin of all society, and see it in its inception. "Male and female," God created the first parents; and these becoming the parents of children, the family is formed and bound together by ties inherent in our nature, and the strongest in nature. These partake of the character of an instinct, but are more than the instinct that rules inferior beings, for the parental and filial affections endure beyond any physical necessity, and end only with life, and not then without the earnest hope and passionate desire of the family reunion.

As the family increases, and the descendants multiply and marry, and again increase, the grandfather becomes the patriarch of a tribe. Tribes grow to be a people. In the lowest stage of society they live by hunting, fishing, and upon the spontaneous fruits of the earth; thence rise to be shepherds, and to feed their flocks, move from place to place. In pursuit of game and pasturage they come into contact, and contesting for the territory that yields the needed supplies, they make war, and the men become warriors, and then the chief burden is cast upon women to support the family. The American Indians, when found in the north, were in this hunter state; Abraham and Lot were in the pastoral stage; and the Germans, in the time of Cæsar and Tacitus, were in the same stage, only cultivating the soil where the nation rested for a season, without any permanent division or ownership in it. In this condition families followed their military leaders; and as war was the principal business of each people, there was but slight development of the family institution, as we see it in civilized society. The separate home, with its sacred seclusion, ex-

cept as the door is opened by hospitality, was yet wanting to the civilization and happiness of mankind.

The earliest known occupation of our ancestral communities of Northern Europe, was that of shifting masses, moving forward as they had the desire and the strength, regardless of the rights of neighboring communities, except as the latter had power, for a time, to resist the ever onward pressure westward and southward. When these moving masses began to appropriate the soil, and to settle in fixed localities, it was under the feudal system, by which lands were temporarily allotted to military followers, upon condition of rendering military service, or needed supplies in kind. Hence titles came to be held upon tenures which only expired in our revolution. This degree of settlement ripened into greater certainty and duration of title, and the commutation of rents for military services. Villages and towns were built, but at first only at the base of hills, crowned by the castle of the military chieftain, who was their needed protector, as the inhabitants were his necessary retainers. Centuries passed before life and property became so secure as to admit of sparse habitations over the face of the country; and at this moment all Europe retains the features formed by the insecurity of the middle and prior ages of its history. There everywhere are yet seen the heights crowned by often crumbling castles, with the village or town beneath, while wide and distant tracts are cultivated, in small subdivisions, by villagers who each night return to their village homes.

As the arts advanced and towns grew into importance, and the military lords borrowed of the rich burghers, or sold them lands to obtain money to enter upon the crusade to Jerusalem, and commercial cities arose under royal charters, and formed leagues against the chiefs who had levied tribute on travellers and trade, a greater dependence was placed upon the central government or crown, and the people gradually became disenthralled of the local military despotisms. With a general government of law pervading a national territory, came security to families, and thence arose the modern civilization of Europe and America, the highest and most intelligent the world has yet known. In ancient Jerusalem, and Athens, and Rome, a high civilization and refinement had indeed been known, but that refinement became steeped in corruption; for the world had not then known the true source of the highest refinement of human manners; and when Christianity first spread over Southern Europe, while yet under Roman rule, it was slow to produce its legitimate effects, by reason of the previous deep corruption; so deep, indeed, that it could

only be cured by a fresh infusion of barbarian vigor, and the eradication of degenerate men. But the infusion of Huns, Goths, and Vandals, were rough materials for Christianity to mould into civilization.

Though rude and warlike, these invading hordes from the great Northern hive supplied the needed elements for the renovation of the corrupt descendants, now the fragments of the Roman Empire. These conquerors of the Empire became themselves captives to the Christianity of the conquered; and that faith, a milder climate, and the more refined manners of the South, had their natural civilizing influences upon the new settlers in Southern Europe and Northern Africa. These brought not only their fresh and uncorrupted natures from the forests of Germany, but they also brought with them a characteristic peculiar to themselves, worth more than all the civilized effeminacy they displaced,—they brought with them a profound reverence for woman. Let us remember this, for it is the element of the world's highest civilization, next to Christianity, for nearly two thousand years, and is to co-operate with that faith in the indefinite future.

Of their earliest written history Tacitus gives the best account, and in this wise speaks of the sentiment of the ancient German mind towards their women, in whose presence they fought their battles, with the dreadful alternative that defeat would destine wives and daughters to the horrors of slavery: "There is, in their opinion, something sacred in the female sex, and even the power of foreseeing future events. Their advice is, therefore, always heard; they are frequently consulted, and their responses are deemed oracular. We have seen in the reign of Vespasian, the famous Veleda revered as a divinity by her countrymen. Before her time, Aurinia and others were held in equal veneration; but a veneration founded on sentiment and superstition, free from that servile adulation which pretends to people heaven with human deities." (Sec. viii.) Tacitus further says, "Marriage is considered as a strict and sacred institution. In the national character there is nothing so truly commendable. To be contented with one wife is peculiar to the Germans. They differ in this respect from all savage nations." (xviii.) "In consequence of these manners, the marriage state is a life of affection and female constancy. The virtue of the woman is guarded from seduction. No public spectacles to seduce her; no banquets to inflame her passions; no baits of pleasure to disarm her virtue." Her

very infrequent infidelity to the marriage vow was instantly visited by ignominious punishment, and unpardonable dishonor. (xix.)

This praise of the philosophical historian and censor of Roman morals, is given in manner to point the contrast with the corrupt manners of his own country. He had witnessed the effects of the vices that had largely brought marriage into disuse, at a period when Rome had been greatly depopulated by foreign and domestic wars; an evil which Augustus had sought to remedy by bringing marriages into credit by rewards and privileges, and celibacy into discredit by disfavor and penalties; and the censures of Tacitus stand in accord with those of Horace, and Juvenal, and St. Paul. In Asia the condition of woman was that of constrained seclusion; and, where not under restraint in Southern Europe, she enjoyed to abuse her liberty; led to do so by he who should have been the protector of her virtue. It was only when Christianity met the uncorrupted manners and better natural character of the uncivilized German nations, that came together the fitting elements needed to reconcile the European freedom of woman with her inviolate purity; and to make woman and the family instruments of the world's most perfect civilization and happiness. Yet we must never forget that Rome in her better days had her Lucretia, Cornelia, Portia, and even in evil times had her Agrippina, Arria, Cæcina, Fannia, Sophronia, Valeria, Paulina. Even then woman had the glory of resisting the tide of corruption, as she soon after had the glory of martyrdom in the establishment of the Christian faith, that was to do more than restore her to her former virtue and influential position.

Greece, the most cultivated of ancient nations, placed woman in a higher position than the Asiatics, yet placed her not so high as we see her, as the trusted counsellor and friend of her husband, as well as influential matron of the household. "The wife is housewife and nothing more," says Heeren. "Even the sublime Andromache, after that parting which will draw tears as long as there are eyes which can weep and hearts which can feel, is sent back to the apartments of the women, to superintend the labors of the maid-servants." "We meet with no trace of those elevated feelings, that romantic love, as it is very improperly termed, which results from a higher regard for the female sex. That love and that regard are traits peculiar to the Germanic nations, a result of the spirit of gallantry, but which we vainly look for in Greece. Yet here the Greeks stand between the East and the West. Although he was never to revere the female sex as beings of a higher order, he did not, like the Asiatic, imprison them by troops in a harem." (Heeren's Greece, 95.)

In speaking of peoples having a Germanic origin, those of England and Gaul are included, for these countries, before, as we know after their historic ages, had no doubt received accessions, or suffered conquests from the north of Germany, called the "womb of nations." Tacitus conjectured the Britons to have come from the neighboring continent. "You will find," he says, "in both nations the same religious rites, and the same superstition. The two languages differ but little;" he says, speaking of the Britons and the Gauls. (Life of Agricola, lxi.) After the Roman armies had been withdrawn, and the Picts and Scots made inroads, the Saxons, including the Engles, who gave name to England, were called in from the north of Germany; to whom succeeded the Danes, and afterwards the Normans, all of whom sprang from the same prolific source. Normans, though last from Normandy, meant Northmen; as Germans meant *gere*-men, or warmen; a generic name that described, by their most striking characteristic, the many peoples of Germany, who, under various names, bore down upon every country of Western and Southern Europe.

The Germans had no doubt a previous Eastern origin, since philology and other traces indicate that the stream of population had flowed from Central Asia, the real source of the German nations. Whatever had been their original condition, the masses moved westward, as hunting, pastoral, and warlike nations; conditions incompatible with the jealous seclusion of women, which has always characterized Southern Asia. Under the necessity of sharing the toils, hardships and dangers of husbands, fathers, and sons, who passed all of life in moving camps, seclusion and effeminacy were not the traits either of the sons of Tuisto or Odin, or of the daughters of Freya. Exposed to common dangers, and liable to be separated from husband and children by the fate of battle, and to become the slaves of the conquerors, a fate more terrible than death, their anxieties quickened their perceptions and foresight, and they became, beyond their husbands, thoughtful, astute, prophetic of the future; became their assistants in battle, the nurses of the wounded, the providers for the family; man's truest friend and counsellor. Life then was nearly a constant warfare; the soil was without fixed ownership; was sparsely appropriated, but while the crop of the season should mature and be gathered. By the law that sprang from their profound reverence for woman and the marriage relation, the husband was allowed no second wife to share with her his affections; nor was she permitted to take a second husband even after his death. Under this stern

abstemiousness, so different from the husband of Asiatic habits, or of Roman customs and manners, with their shocking facilities of divorce, the trusted and faithful wife held a most influential place in the family, as well as became a counsellor in public affairs. Hither, then, and to this rude age, it is believed, we may mainly trace the origin of that different treatment of women which has distinguished Northern and Western Europe, during all her historic period, from all the rest of the world, and which has largely contributed to place that smallest of the four continents in the front rank of the world's civilization; a sentiment and treatment which must continue to influence the world while the human race shall last.

It could not be otherwise than that woman should have attained to an exalted influence among the ancient inhabitants of Germany, when we further read from Tacitus how closely her fate was allied to her husband's and what was her participation in his achievements. "They fight in clans, he says, united by consanguinity, a family of warriors. Their tenderest pledges are near them in the field. In the heat of the engagement, the soldier hears the shrieks of his wife and the cries of his children. These are the darling witnesses of his conduct, the applauders of his valor, at once beloved and valued. The wounded seek their mothers and their wives. Undismayed at the sight, the women count each honorable scar, and suck the gushing blood. They are even hardy enough to mix with the combatants, administering refreshment, and exhorting them to deeds of valor. From tradition they have a variety of instances of armies put to the rout by the interposition of their wives and daughters again incited to renew the charge. Their women saw the ranks give way, and rushing forward in the instant, by the vehemence of their cries and supplication, by opposing their breasts to danger, and by representing the horrors of slavery, restored the order of battle. To a German mind the idea of a woman led into captivity is insupportable. In consequence of this prevailing sentiment, the states which deliver as hostages the daughters of illustrious families, are bound by the most effectual obligation." (Manners of the Germans, vii, viii.)

When the migratory nations in and from Germany, became fixed to localities by an appropriation of the soil and its use in agriculture, under the feudal system, and subject to its military services, which in England were only terminated by statute in 1660, the condition of private families became the more secure, and more subject to the meliorating influences of the mother, wife, and sister, so long as they

were held in respect and honor; and that they should be so held, there were the concurring causes of marriage to one wife, the inherited reverence for the sex, and the power of the Christian faith. This sentiment of loyalty to woman was the light and the life of the nations through the dark ages; and when ignorant and brutal men, in the security of their feudal castles, became the tyrants and oppressors of men and women, that sentiment was relumed with yet greater brightness, and produced the ages of chivalry. Then brave and thoughtful and humane men counted it their highest happiness and honor to relieve oppressed innocence in the championship of the honored sex. An enthusiastic sentiment, kindred to religious devotion, filled the breasts of the orders of knighthood; and woman was loved not only for what she was, but in the highest ideal that the enkindled imaginations of men could form of her excellence; and men and women were alike elevated in purity and character, as they truly cherished these exalted sentiments. The transition was easy and natural, and the chivalry of Europe became the crusaders of the East; then rejoicing both in a devotion to the ideal of woman's excellence and to the Cross of Christ. The Council of Clermont, which in 1095 authorized the first Crusade, formally recognized chivalry by declaring, "that every person of noble birth, on attaining twelve years of age, should take a solemn oath before the bishop of his diocese, to defend to the uttermost the oppressed, the widows and orphans; that women of noble birth, both married and single, should enjoy his special care; and that nothing should be wanting in him to render travelling safe, and to destroy the evils of tyranny." Thus did the church and religion lend their holy sanction to the high sentiment of humanity that gave life to chivalry. Yet observe, that oath was limited in its special application to "women of noble birth!" Better this than none; yet how narrow it seems in this age, and in a Christian republic.

How much better the sentiment I once heard from a Swedish artisan, who gave up his seat in the coach to take one on the top in the rain, to accommodate a plain woman who applied for a passage: "I always remember that my mother was a woman!"

Hallam, who thoroughly surveyed the history of the Middle Ages, says, "I am not sure that we could trace very minutely the condition of women for the period between the subversion of the Roman Empire and the first Crusade; but apparently man did not grossly abuse his superiority; and in point of civil rights, and even as to the inheri-

tance of property, the two sexes were placed as nearly on a level as the nature of such warlike societies would admit." (Middle Ages, 329.) It was a necessity of the military services to be rendered under the feudal system, that the eldest son should be preferred to the inheritance of lands held by military tenure. Hallam acknowledges that "A great respect for the female sex had always been a remarkable characteristic of the Northern nations. The German women were high-spirited and virtuous; qualities which might be causes or consequences of the veneration with which they were regarded." He should have said these qualities were both causes and consequences of that veneration. He speaks of the spirit of gallantry, cherished as the animating principle of chivalry, as due to the progressive refinement of society in the twelfth century, and he might also have acknowledged it a cause to produce that refinement; for by action and reaction, causes and effects for good or for evil, are of perpetual reciprocal operation; and hence the greater encouragement ever to strive for the good, since effects ever become causes in a ceaseless concatenation. Can we say less, when this our age rejoices in the beneficent effects of a sentiment that pervaded the breasts of our rude ancestors, two thousand years ago, in the forests of Germany? a sentiment then peculiar to them, and destined to become yet brighter in their descendants, and to illumine more widely the world, if men and women will but conceive and practise the highest excellence of which they are capable.

It is in Heeren's philosophical reflections upon Greece, that we find the truest expression of the source of European superiority over all other nations, howsoever much we may differ or agree as to the effect of climate or physical causes.

Similarity of climate does traverse the circumferences of the globe, in all its different latitudes, though the same degree of temperature follows waving geographical lines; yet the habits and manners of every people are diversified in degrees, much beyond all that can justly be ascribed to the single cause of the presence of heat or cold, clouds or sunshine; and immeasurably beyond the single cause of climate do the civilization, intelligence and power of the Europeans and their American descendants surpass those of all other nations. And, if all the causes of that difference be examined and considered, it is believed that no single one, other than religion, can justly claim an equal influence over the formation of character with that which results from the European family, and woman's power in the family, as there and here constituted.

After adverting to the physical causes of climate, soil, and geographical configuration, and the disadvantages of being yet in the shepherd state of the Tartars and Mongolians, among unsubdued forests, Heeren proceeds to ask, "But, can we derive from this physical difference, those moral advantages which were produced by the better regulation of domestic society? With this begins, in some measure, the history of the first culture of our continent. Tradition has not forgotten to inform us that Cecrops, when he founded his colonies among the savage inhabitants of Attica, instituted at the same time regular marriages; and who has not learned of Tacitus, the holy custom of our German ancestors? Is it merely the character of the climate which causes both sexes to ripen more gradually, and, at the same time more nearly simultaneously, and a cooler blood to flow in the veins of man; or, has a more delicate sentiment impressed upon the European a higher moral nobility, which determines the relations of the two sexes? Be this as it may, who does not perceive the decisive importance of the fact? Does not the wall of division which separates the inhabitants of the East from those of the West repose chiefly on this basis? And can it be doubted that this better domestic institution was essential to the progress of our political institutions? For, we make with confidence the remark, no nation where polygamy was established has ever obtained a free and well-ordered constitution. Whether these causes alone, or whether others beside them (for, who will deny that there may have been others?) procured for the Europeans their superiority, thus much is certain, that all Europe may now boast of this superiority. If the nations of the South preceded those of the North; if these were still wandering in their forests when those already had obtained their ripeness, they finally made up for their dilatoriness. Their time also came; the time when they could look down upon their Southern brethren with a just consciousness of superiority." (Heeren's Greece, 8.)

It is believed that such philosophers as Buckle are quite too limited in their conceptions, when they ascribe to material causes all the differences of national character. These have truly modifying influences; but human sentiments, thoughts, traditions, law, song, religion, may have yet greater effect to form the character of nations; that is, moral, mental, and religious causes may be more potential than the differences of the physical causes pervading the world.

The first inhabitants of Northern Germany, while in their pastoral state, could not have been influenced by physical causes essentially different from those which influenced their Mongolian relatives in

Asia; the elevated table land of the latter giving them the lower temperature that belongs to a higher latitude on the western side of that hemisphere. That is, as we go westward, we go furtner northward to keep in the same temperature, at the same elevation. The climate being similar, and the mode of life the same, the religion of both derived from the Indian mythology, and woman, necessarily the exposed companion of man, while both pursued a nomadic life, living in temporary huts, the physical causes operating upon the kindred people of Asia and Europe, under the same temperature, could be little different. Nothing can be pointed to as cause for the extraordinary disparity of results, except a different religion during later centuries, so significant as the German's high respect for woman, with a single wife and mother in his family; while his ancestral nations in Asia had no such exalted sentiment, or lost it, and continued to live in polygamy, with a liberty to divorce their wives at pleasure: causes heightened in effect by the acceptance of Christianity in Germany, and of Budhism, as the religion of Central Asia. From the rude and warlike Goths, Vandals, Huns, Lombards, Saxons, all parts of Europe have attained the highest and most intelligent civilization known to the world, while the Mongolians and Tartars have made no considerable advances in civilization since written history has furnished her narratives. It is true, a milder climate and the intermingling with civilized peoples in the south, helped the process of amelioration; but these causes could not operate in countries bordering on the Baltic and the German Ocean, which had no influx of people from the south; where yet may be traced a profounder respect for woman, and a more vigorous manhood than in the south of Europe.

The sentiment of devotion to the sex ran highest in its profession in the ages of chivalry and romance. But this was not the wholesome and practical condition of society, which we should recommend as best adapted for woman's true welfare and the true interest of society. Tournaments and courtly assemblages of the nobility were not the best school of her training. All that glittered so brightly, was not truthfully of intrinsic purity and value. Virtue is not best preserved where a prince and nobility enjoy by law, or privilege, or opinion, an immunity from the common responsibilities of men. Kings, who legally could do no wrong, became the greatest wrongdoers, and set examples to their courtiers, sure to be followed for evil in all the gradations of society. It was in the middle rank of

society, with its fewer temptations, that virtue chiefly took refuge; and it was there that woman fulfilled her most useful duties in the family, and was held in highest regard. It is consequently in the greater equality of a republic where her power can be made to be most pervasive and useful; and it is there that men and law should do all that is practicable to aid her best influences, and to sustain the conservative power of the family. Between a republican equality and a Christianity where all are equal in the Divine sight, there is the highest congeniality, and these double potencies should here place woman where she shall exercise her happiest influences.

The peoples of all Europe were virtually divided into classes, during the middle ages, and are so yet. There existed kings and queens, lords, nobility, gentry, and freemen, and yet another numerous class who were not freemen, and were not comprised nor secured in the rights of England's Magna Charta. These, and their children, belonged to their master, and all that they could acquire belonged to him. They were bound to his person or estate, could be reclaimed if they escaped, had no legal redress for wrongs done their persons, and were compelled to do the lowest work, and perform the most menial offices. They were called villeins, and were slaves of the same color and blood as their masters. The name they gave to our language signifies how they were regarded. It is obvious that their condition was, as all slavery is, wholly hostile to the attainment of the highest civilization, and to the best influences of the family relations, and that as regards both master and servant. This thraldom gradually wore out, under the beneficent influences of Christianity, and its last vestige disappeared under the first king of the line of Stuarts. Our own Magna Charta declared all men free and equal, and in terms made no distinction of class; yet was there an exception understood, and described in the Federal Constitution, of the worst phase of slavery.

In the same ages that slavery was expiring, as an effete institution, in England, the merchants of the same British nation and some of her colonists this side of the Atlantic, were busy in planting it in her colonies, and we took it as an inheritance at our Revolution; and without its recognition, the Federal Constitution could not have embraced all the original thirteen of the United States. It was taken by part of the North as a hard necessity, while part voted for it. Its fruits have always been inimical to the best education, and to pure morals in the family, and are now felt in a bitter fratricidal war. Should

it expire as a consequence of that war, it will relieve the Northern conscience of a long-endured sense of national wrong.

That a people may be happy and virtuous, all must be of equal civil rights, and of one grade, except as talents and culture and virtue make individual differences; otherwise it is in human nature that the favored class or classes will degrade and oppress those of lower rank. Woman must be protected by severe laws in all her personal rights, as with us she is, and also by a sound public opinion. Man must not, by law or public opinion, be suffered to have an impunity in trampling upon the weak, or of arrogating to himself more of God's best gift to him, than the proportion provided by the Author of nature. Slavery and polygamy are both incompatible with a just equality of rights, and with human happiness, and are especially destructive of the virtue and beneficent influences of the family. They are evils and wrongs, whose extirpation is always a question but of the means and time of execution.

Marriage between one man and one woman, with fidelity to the marriage vow, is the natural order from which man and woman derive their fullest happiness, and society its best welfare. The equality in the number of the sexes, through all the centuries of time, shows the Creative purpose that but two should become the parents of the family, and when but two, these have the highest incentives of mutual effort for the welfare of the family, without the jealousies and strifes and degradation incident to polygamy. United in affection and counsels, each sustaining the courage and confidence of the other, the two attain a success greater than the aggregate of their separate efforts; their kindly feelings towards each other and their children, have their natural exercise, and these are happiness; and they escape the idiosyncrasies which sometimes make singular those who pass unwedded through life.

Those temperate observances which belong to the family thus constituted, save from the severe penalties that spring from a capricious incontinence, and from a terrible disease, that seems to have been set as a guard to vindicate the natural law of temperance, modesty, and discretion. Population then increases faster, children are better nurtured, more healthy and happy, and become better citizens, for all social and industrial purposes, and for the support of the government. The family, too, if fidelity be observed to its relations and duties, saves man from his worst enemy, himself; saves him from vices that extinguish his affections, vices that cannot be habitually followed without turning his heart to stone. When celibacy and cor-

ruption become the rule, the state is lost: Rome would not have fallen before the barbarians, if the Roman people had not first been diminished and weakened by the loss of the virtues that sustain the family. Their frequent and unscrupulous divorces and transfers by new marriages were more cruel and demoralizing than an authorized and regulated Asiatic polygamy.

The family constituted as we see it, is the most healthy and happy arrangement, though susceptible of some improvement in the best, and of great improvement in the many. There only is found a mutual sympathy and support, many defences against the assailing evils of life, to which separately its members would succumb. While writing these pages I have received the Fourteenth Annual Report of the Mission in the Insane Hospital of our city. The experienced, faithful, and observant chaplain says, "We must remember that the quiet comforts of home do much to keep in tune the harp of a thousand strings. And this brings up the collateral thought that the divine institute of the family builds a wall around the intellect as well as the heart. The isolation of a homeless and unsettled life has always done much to develop morbid mental conditions. The brains which yield are not generally those of the toiling heads of families; the detached in society succumb the soonest. We think the tables of our institutions catalogue this result. Hence, whatever in our social habits inhibits the general prevalence of the matrimonial relation, adds to the harvest of alienated mind. A rational home culture will soon depopulate our asylums; but when will this culture prevail among us?" The Rev. Edward C. Jones, who thus speaks, then adverts to the evil of a demand for wealth before the young will risk settlement in life, instead of being mutually willing to live simply, exertively, and happily, as the chief cause of discouragement of marriages.

It is in sickness and sorrow, "when pain and anguish wring the brow," that the home becomes indispensable to human cure and preservation. One who writes forcibly from observation, and with a humane feeling, though too often disposed to raise a veil that modesty should forbid, says truly, "Nature has bound up life within a triple and absolute tie. Man, woman, child: separately they are sure to perish, and are only saved together." (Michelet.) And many and sad are the proofs he gives in his own country, France; that gayest and saddest country on earth; whose celibacy, and marriage with its sacred pledges unobserved, are alike productive of immensity of misery. Paris is at once the centre of the world's

most brilliant displays of wealth and fashion, and of the exhibition of the most deplorable vice and misery; here in constant and closest contact and shocking contrast. Her levity and brilliancy cannot mask, and, therefore, but mock her woe.

The causes operative there to produce these results, should be beacon warnings to us. There, though there be not legal slavery, is every inequality of rank and wealth, with laws to perpetuate that inequality. There has long been suffered an unhappy loss of religious faith, that has dissolved the sacred attachments of family, and made a jest of promises that should be regarded as holy. There abound women more than can find honest employment and adequate remuneration; and many more men than can obtain wages to maintain themselves and family. These form not families, and know not their salutary restraints, nor enjoy their conservative happiness. Hence the same author says of his own nation, "Woman is no longer esteemed for the love and happiness of man, still less for maternity; but as an operative." Let us hope this is but the darkest side of the picture, portrayed by one who, though painting from the life, paints with strongly contrasting colors. Yet are there writers there who have given us perfect portraitures of women, found even in France.

It is to the families of the commonwealth that nearly all of moral training is to be traced. There the sentiments and principles of religion are effectually cherished and enforced. There spring the impulses of charity, that often surpass in contribution the aggregate of the public revenues. There the sentiments that give tone to public opinion are formed; an opinion that makes and executes the law, and guides the national policy. The families of society are the ballast of the commonwealth, that preserves law and order, in the midst of excitement and disorder, and restores tranquillity after a state has been convulsed by violence and rebellion.

And does the Government demand soldiers for its defence under those circumstances which have occurred in all history, in a world with elements of evil as well as good? It is in the families of the commonwealth that they are to be found in greatest numbers, with the best physical development, and best moral training; with patriotism, loyalty, and intelligent efficiency. These bring with them a double pledge of fidelity, in the love of the family, whose eyes are upon them, and the love of country. These act under a sense of duty that the homeless cannot know. Though war can only spring from evil, and no war can ever arise where one party is not in the

wrong, to provoke or bring it on, we must admit individuals may, nay, must, act under the most exalted sense of duty, when they peril life for the love of their country.

Professor Peabody bears strong testimony to the value of the family in this comprehensive summary. "While filial obedience alone can train worthy subjects to the state, there are yet other aspects in which Government depends on the home-life, and is sustained by the family relation, so that, for a homeless community, anarchy or despotism would be the alternative. To an incalculable degree the home instinct supplies the place of law, supersedes the harsher ministries of government, prevents crime, anticipates want, divides and lightens burdens, which else no public organizations could bear. The gravitation toward home is in every nation a stronger force than its police and armies are or can be, and accomplishes many purposes of prime importance which they could in no way fulfil. The few homeless members of a community are of immeasurably more charge, burden, and peril to its constituted authorities, than the overwhelming majority that have homes." As much then as we should hold government and law in honor, and cherish the sentiment of loyalty to it, we owe the like regard to that smallest civil institution, the family; for without it social order could not exist, government could not live, except it be as a despotic force, to rule by military restraint the chaotic elements of an unorganized people, preferring misrule, license, and disorder. Such people could be no law or police to themselves.

To encourage the family and its beneficent influences, we must discourage all that militates against it. All systems of communism that tend to loosen the ties of family, or to dissever those ties, or to prevent the formation of families, are to be discountenanced as normal institutions. Indeed, from the nature of man, these can never be the general order of society. Spartan citizens may be separated from their families, and be trained to the endurance of self-denials and hardships, and to the observance of secrecy, by the iron discipline of a Lycurgus; and religious orders, fleeing from the world, repentant of their sins, may carry their self-discipline and penitential inflictions to the extreme of human endurance, as imposed by a head inexorable as a Loyola; but surely these results will be attained at the fearful sacrifice of all that is genial in social life, and of all that can make this life a happiness to its possessor. Modern reform communities may be formed with the good purpose to make life more cheerful and happy, as we have seen a number in our day; to

obtain more economically the physical means of livelihood, with more of literature, science, and social amusement. Yet such a social community is an artificial creation; and not resting on a natural basis, it is formed but for a transient existence, and then to expire. There are always in these too many heterogeneous elements brought together; and these have not the powerful family interests and affections to preserve harmony, or to produce reconciliation. Diversify the employments, instructions, and amusements as you may, the machine, if it moves smoothly, will move monotonously; and if it will not move smoothly, the parts will clash; and in either way will run down, without power to wind itself up.

There are, it is true, religious communities, enjoying celibacy, which have an enduring existence. The deeply absorbing interests of a common faith and worship, and sometimes more potently, perhaps, persecution, holds them together. Their members are the exceptional beings who have renounced the affections and ties of the world, as well as sought refuge from its temptations and trials; have also renounced in part the affections of their own nature; and, except as they can anticipate the joys of heaven, theirs seem to us to be but as a semi-life, or a semi-death. Yet these institutions have a mission on earth that is touching to the sentiment of humanity. They are places of retreat for those stricken with sorrow; those for whom this world's flowers of hope are blighted, its fruits been turned to ashes; foot-sore pilgrims, who, without joy in life, dare not anticipate that transition they so much desire. Here these may tranquilly rest, and waiting, not only find the consolations of devotion, but in their visitations of mercy to the afflicted, or in the education of youth, may become the best of human benefactors. Yet these must be exceptional, or the world would not be peopled, nor souls be multiplied for earth or heaven. It is the family of parents and children that we must look to as the true source of population, of moral and educational training, and as the natural basis of society and good government. God has instituted it, and it must so abide forever; and we must care for its members as we would save society.

Have I seemed to place undue importance on the power of woman and the family to advance the world's well being? Listen then to some of the world's eminent theoretical legislators.

Jeremy Bentham, in his Theory of Legislation says, "Marriage, considered as a contract, has drawn woman from the severest and most humiliating servitude; it has distributed the mass of the community into distinct families; it has created a domestic magistracy; it

has formed citizens; it has extended the views of men to the future, through affection for the rising generation; it has multiplied social sympathies. To perceive all its benefits, it is only necessary to imagine what men would be without the institution."

The Baron William Von Humboldt, formerly Privy Councillor of State and Minister of Worship and Public Instruction in Prussia, in his treatise on "The Sphere and Duties of Government," speaks upon the subject in language more closely bordering on eulogy, and ascribes to woman a higher ideal of human excellence, both in her conception of it, and in her practical fulfilment of that conception. He advises against governmental interference in the formation and regulation of a relation so delicate as that of matrimony, which must rest, to be successful of happiness, on mutual inclinations; though the government be most deeply interested in population, and the early training of youth. He says, "After careful observation, it has been found that the uninterrupted union of one man with one woman is most conducive to population; and it is likewise undeniable that no other union springs from true, natural, harmonious love." He, while disclaiming the policy of the state's interference by law that commands, to mould the arrangements that belong to nature's mysterious elective affinities and to the sacred precinct of the family, bears his testimony to the fact, that "experience frequently convinces us that just where law has imposed no fetters, morality most surely binds." And as it is wise for the law to forbear the exercise of its coercive power, so long as inclination and a sense of duty rule to the end the law most desires, so the husband, with whom is the final family authority, should forbear to interfere so long as the wife and mother are, with adequate intelligence, performing the functions of domestic rule, with a wiser government of blended authority and affection than belong to his sterner nature. Of woman's fitness for this high task he speaks in terms of glowing eulogy, surpassing those I would think proper before this grave audience; for in her he beholds concentrated "each human excellence," "the whole treasure of morality and order;" saying, with the poet,

"Man strives for freedom, woman still for order."

That "while the former strives earnestly to remove the external barriers which oppose his development, woman's careful hand prescribes that inner restraint, within whose limits alone the fulness of power can refine itself to perfect issues; and she defines the circle with more delicate precision, in that every sense is more faithful to her simple

behests, spares her that laborious subtilizing which so often tends to enmesh and obscure the truth, and enables her to see more clearly through the intricate confusion of human relations, and fathom at once the innermost springs of human being." This is modern German testimony to an inherent quality in woman, from a highly cultivated source, in a civilized age; yet in accord with that borne by Tacitus, as to the ancestors of the same race, living on the same spot, nearly two thousand years before, but then, by polite Rome, called "savage."

The Baron Humboldt is evidently speaking of a woman of superior intuitions and culture; and unless the wife and mother be of an intelligence and disposition to enable her to fulfil her domestic duties in a successful manner, all that is here averred to be her appropriate and beneficent power and influence will be without its assumed foundation. We see then what should be the endeavor, that woman may fulfil her mission to the world; we may also see what this should be by countless examples; examples which should be made the prevailing examples, that society may attain its highest, happiest condition. Of such, we may agree, the poet is not extravagant in description and praise:

"A being breathing thoughtful breath,
A traveller betwixt life and death;
The reason fair, the temperate will,
Endurance, foresight, strength and skill."

"With yet a spirit still and bright,
With something of an angel light."

WORDSWORTH.

And, elevating our views above the ordinary affairs of life, it is in the wife and daughter, with their higher susceptibility to a religious faith, men find the most persuasive influence to believe and act as they, with a purer purpose and more earnest hope; since the fruits are so surely demonstrative of the truth of their faith, in the practically seen beauty and happiness of holiness. Whatever may be the difficulty or obstruction in the mind of the father of the family, none who truly loves his children, and looks forward to their welfare through life, and in its exit, but desires that they may possess the pure and unhesitating faith of their mother; that they may the better resist evil, and be sustained in trials, in sickness, and in death. And it must be conceded that it is mainly in woman's more susceptible sympathies and intuitive initiation in Christian truth, that she has very often been a pioneer of Christianity and the world's civilization. For one, I confess to the long-entertained belief, that if woman had

not been constituted with more humanizing tendencies and a more trustful faith than man, religion could have had but little hold upon mankind, and civilization would never have been. I say this with the same deliberate carefulness of observation and thought, with which the naturalist gives us the result of his careful observation of what he describes in the animal kingdom.

The family is indeed a divine institution, and beneficent in all its influences. The first thought of it, in the mind of virtuous youth, is highly educational, by impulses that are of Creative origin. As surely as that the pulsations of life have been given by the Creator, so surely must have proceeded from Him the emotions that conduct to the connubial compact; and these are, or should be, elevating and refining. Youth has a quick perception of the comely in person, graceful in manners, and perfect in moral excellence, and beholds these qualities to admire and emulate them. And what they admire the two sexes seek to be, that they may be acceptable to each other. This saves the young man from the peril of degrading association; and it is under the influence of love, and in obedience to its requisitions, that man is inspired to dare and achieve. It is by this that the world receives in the great aggregate, its mightiest onward impulsion. Man, nor woman, would ever struggle, strive and achieve as we witness, but to be united in happiness and to maintain and elevate the family in comfort, respect, and honor. Without the family, society would lose more than half its industry and enterprise; the nation much more than half its resources and reliance for the maintenance of order and of good government.

The law calls marriage a civil contract: it is not the less a religious one,—religious, by the law of nature, and by the law divine. The Holy Scriptures bestow upon it their highest sanction, and in all its relations their terse and comprehensive commands. Have said of the husband and wife, "They shall be of one flesh." Have given the commands, "Husbands, love your wives;" "Wives, submit yourselves unto your husbands." Have bid him remember that she is "the glory of the man." They have said to the child, "Honor thy father and thy mother;" to "children, obey your parents;" to "fathers, provoke not your children to wrath;" to servants, "count their masters worthy of all honor;" to masters, know "that your Master is also in heaven." And Jesus called the little ones unto him, saying, "Of such is the kingdom of heaven." Thus on every side all those who make the family, are the objects of the Divine regard and protection. And on this sacred authority, in living with our children, unless we have

marred Heaven's highest gift, we are already loving those nearest like unto celestial beings.

In considering the members of this little community, whose repetitions make the commonwealth, it is unprofitable to advert to the often contested point of the mental superiority of the sexes; for each is incomparably superior to the other, in the respective spheres of action most obviously assigned them by their Creator. Without their inherent differences the family could not be made up; would not have its sustaining attraction and interest. These differences make the accord of the whole. Without the husband performed the duties for the family he is best fitted to fulfil, or, if the wife performed not those she is best qualified to perform, they never would be well performed; and without the beautiful relations which we perceive to be harmoniously maintained under the influence of the affections, the family could not continue to exist; and with the loss of these domestic ties and relations, all that is most humanizing and conservative of the welfare of the race would be lost. It is very true, as Michelet says, "To educate a daughter is to educate society itself. Society proceeds from the family, of which the wife is the living bond."

Are we curious to consider the nature of the government that belongs to the family? Let us try the comparison then between this and other forms of government. It is not a monarchy; nor an aristocracy; nor a republic. True, the law regards the husband as its head; and in relation to law and to the political government, this is generally his position. But in the family, happily constituted, he is not king, nor sole ruler. The wife and mother must share his rule, and must constantly perform many the most duties of that rule. Yet, is she not queen; at least, not queen-absolute; for his authority is paramount, if, unhappily, they differ. But she is more than queen-consort; for the government is not that which He intended who set them in family, if their power be not conjoint and harmonious. If the husband be wise, and wisely mated, the ostensible rule of the family will be hers, who is most constantly present to regulate, order, and compose all differences. She will, therefore, be more than queen-regent; for she exerts, not a merely delegated, but her own authority, as well as his; with the advantage of his counsel in the executive council chamber of two; where, indeed, he may have a veto power, to be sparingly exercised. What she is, and what she will do, if she be prudent and wise and exertive, the mother of King Lemuel has inimitably described: "Her price is above rubies. The

heart of her husband doth safely trust her." "She openeth her mouth with wisdom, and in her tongue is the law of kindness. She looketh well to the ways of her household, and eateth not the bread of idleness." (Prov. 31.)

This domestic rule combines powers that would be most dangerous, if united in the hands of a single political executive; of one who combines the legislative, judicial, and executive authority. But in the institution of the family, this concentration of powers is not dangerous, as a general rule, while it must necessarily exist. They are virtually in one; for in their exercise, husband and wife must act as one. Their dual reign must have the concert of unity of counsel and of action; will be tempered by the love of children and their love of each other; and will be restrained by the ceaseless consciousness towards the residue of the family, that they who are masters on earth, "have a Master in heaven." If these influences be forgotten, the family is not that which God intended to set together; and he who violates that intent, is traitor both to God and his own happiness. He who is despot in his family, must expect that family to reflect no joy to him. And many there are who perform their moral obligations respectably well, who know not how much more of happiness lies unelicited within their easy reach, for want of genial and social attractiveness to wife and children; whose happy social sensibilities are chilled, or not drawn forth in those reciprocations that give home its joys and life its purest happiness.

Pardon my having so long dwelt upon that which is obvious to you all. It is with purpose to impress upon others, and women themselves, how available may be made their influence and that of the family, for the advancement of human welfare and civilization. Evidently, the Creator has intended the fulfilment of a higher mission than man or woman has yet generally fulfilled. Countless are the examples of exalted excellence and virtue in both; but these are to be multiplied everywhere and constantly. Yet will the moral safety of mankind rest mainly with woman:

> "Spirits are not finely touched
> But to fine issues."

So said the master observer of the human heart. And finely touched spirits can alone reach to touch and mould the tender and impressible heart of children, and leave upon it impressions that shall endure through life, and after life. For that duty, neither the father nor the teacher will adequately suffice. Their ruder appliances and tem-

per, the rude nature of the boy resists. It is the mother only that can soften his rugged tendencies; and she alone is fitted to guide and impress the gentler sex. She alone has the patient endurance to continue the task of saving the son she has borne, when bent on vicious ways, hoping against hope, to save him from himself, for himself, for his family, and for his country; and to save him for that family union hereafter, which she ever fervently prays may be complete, no one missing. It is from her maternal solicitude and ceaseless efforts, thus undespairingly exerted; to her ministrations in the first and best temple of worship, next to the purified heart, the home, at whose altar she is priestess, that nearly all that is good may be traced; and especially, that influence, that after many years of alienation, during which the heart has been pierced by many sorrows, will bring back to the native hearthstone the prodigal son. That this is her higher mission, and that she is better fitted for it than man, he need not be jealous; for so the Creator has willed it, and it is for the common good. Let it be his care to aid and never to thwart these her efforts, for they spring from sacred impulses. Their spheres are diverse; and though his high duties be indispensable, hers upon the family are the more important, and the effects more enduring. A more important and elevated sphere she cannot attain and seldom should desire; and she descends from the highest when she attempts to leave it, and not often attempts it without disparagement to herself. Yet woman is not to be too closely restricted to the indoor round of domestic cares, especially after her children have grown to an age to share them with her. Age often sets her free to fulfil the mission to which her generous nature prompts. In many charities, this nation and age, more than any other, have witnessed, how invaluable and devoted have been her self-sacrificing services, in behalf of the uneducated, the insane, and the poor; of the sick, the wounded, and the dying soldier. A censorious world must not, after this age of sacrifices, be indulged in its too great jealousy of woman's strivings to do all the good of which she is capable, to all human sufferers. Her sacred purpose, and the good accomplished, must sanctify her deeds in the breasts of all good men.

We are not disparaged, but exalted, and society and the nation is exalted, when woman is held in honor, and is enabled to dispense her best influences round us. An eloquent French author says truly, "If we wish, then, to know the political and moral condition of a state, we must ask what rank women hold in it. Their influence embraces the whole of life. A wife; a mother; two magical words, compris-

ing the sweetest sources of man's felicity. Theirs is the reign of beauty, of love, of reason. Always a reign! A man takes counsel of his wife; he obeys his mother; he obeys her long after she has ceased to live, and the ideas which he has received from her become principles stronger even than his passions." Aime Martin, to write thus, must have found good women in France; women to redeem their country from our too severe censures.

The inductions to be made from these truths are plain, and the duty the most imperative man can know, since the welfare of his posterity, the prosperity of his country, the enduring happiness of all human beings, are involved. Woman is to be trained with a fuller appreciation in herself of her high trust, and of her capacity for good or evil; and if she be good and worthy of her trust, man is to learn to confide in her generosity, to honor her, and to sustain her authority for good, as something better and greater than his own. His children are to be kept as much and as long under her control as possible, even while they are obtaining their school and college education, and under her influence for life. Women are to make home the happiest place in the world, and husbands and sons are there to find their happiness, and to cultivate kindness and the courtesies of life. If sometimes they seek amusements abroad, wife and sisters should share them. Let them seek no luxuries in selfish seclusion. Let this be their general practice, and how many drinking and gambling houses would there not cease to exist, and club-houses exist only for the cheerless unfortunates who have no family. Hotels would be for travellers; and haunts of vice, not to be named, would be few. The city at night would sleep in peace, its silence unprofaned by inebriate brawlers; prisons and almshouses become of diminished necessity. It is the homeless and traitors to home that cause the chief public charge. Then a public opinion could arise, now too feeble to suppress or restrict by law these sources of countless evils and sorrows, and woman be often saved the most terrible calamities ever inflicted upon humanity, and from which death only can relieve her.

It is not for us in America to boast of our advantages, but to express an overflowing gratitude for them, and leave examples that are good to exert their silent and enduring influences upon other peoples. We may not be boastful, for we yet see large room for improvement, and for the expansion of the good we witness. Yet may we rejoice in the testimony borne of us by recent travellers of the highest intelligence, who have marked a contrast favorable to us as compared with our parental nations of Europe. "You may estimate the mo-

rality of any population, when you have ascertained that of the women; and one cannot contemplate American society without admiration for the respect which there encircles the tie of marriage. The same sentiment existed to a like degree among no nations of antiquity; and the existing societies of Europe, in their corruption, have not even a conception of such purity of morals." (De Beaumont.) "The marriage tie is more sacred among American workmen than among the middle classes of various countries of Europe." (Chevallier.) "One of the first peculiarities that must strike a foreigner in the United States, is the deference paid universally to the sex, without regard to rank or station." (Lyell.)

Moral and religious influences have been dwelt upon as the sources of the welfare of the family, and through the family, of society. What, then, has or can the law do for the same object? It has done much, and may do more; yet the main reliance must ever be upon moral and religious influences that have their operation in the susceptibilities of the human heart. Volumes of law have been written on the domestic relations, defining the rights and duties of husband and wife, parent and child, guardian and ward, and master and servant. These are well and wisely written, yet have regard chiefly to property and government; but law cannot reach to enforce the moral and religious sentiments from which spring the highest culture and truest civilization.

The law has done much less than it might do, because public opinion, that springs from culture and civilization, has not sufficiently advanced to enact and maintain the laws needed for human reform. It is owing to this, that we have not laws adequately restrictive of intemperance, and do not enforce laws that exist against gambling and other vices.

The ancient and existing statutes against vagrancy are the law's assertion of the duty of every one to be a member of a family of fixed locality, and it provides a public habitation for all that have no home,—the Prison, Almshouse, or Refuge.

Law, public opinion, and the habits of our people, have been most beneficially operative in building our City of Philadelphia in an adaptation to the separate residence of each family, and consequently most favorably for the best family influences. Here is provided one house for nearly every family, and of a size and expense convenient for almost every family. When we consider that each house now built, of whatever size, generally has all the conveniences for fire, gas, water, and baths, and that in each may live a family upon the

moderate earnings of the artisan, independently of every other family, with more conveniences and comforts than the most wealthy enjoyed less than half a century ago, it is with a pleasing and grateful feeling that we contemplate the expansion of this largest city of our continent. Its expansions, too, are not like those of some cities, in narrow and uncleanly lanes and alleys, and by mean and neglected dwellings, but on some sides by houses of superior architectural style, and on others by rows of smaller dwellings, neat, cleanly, and complete in comfort. It is much more a cause of satisfaction to reflect that we have the largest city, with the best accommodations for its hundred thousand families, than to have a population of a million or more, compelled to live two or more families in a house. And the law provides, by supervision of inspectors and the enactment of penalties, that houses shall be substantially built, secure from fire, and with ample adjoining space for the admission of fresh air. No more narrow alleys or courts can be built upon for dwellings, nor any dwelling house without an open curtilage of 144 superficial feet. In such a city, when the old parts shall be rebuilt, there can be but few confined places to breed physical or moral disease and contagion, or riot and rebellion. To the providence of William Penn we owe it that public squares afford places of exercise and for fresh air to all families in the centre of our city; and the Consolidation Act makes it the duty of Councils to continue to provide them; a duty that is not sufficiently regarded, but a duty that should be fulfilled by purchases, and not by the arbitrary power of taking the property of the citizen at a price to be fixed by strangers to him, whom he has not selected, and would not trust.

The law has so provided for the education of children in our city and commonwealth, that every one may be educated at the public charge, without any expense to parents for books or tuition. So far as school education can make good members of the family, and good citizens, the law has provided the means, and parents are derelict to their duty who do not make this resource available for the improvement of their children. It is true the law does not coerce the attendance of the children at the schools, yet it is well for negligent parents to know that if their children prove vicious, for want of a proper home and school education, the public has such a paramount interest in them, and in their preservation from vagrancy, crime, and cost to the community, that the law has provided for their being taken charge of, to be better trained, protected, and educated, in the Children's Homes and Houses of Refuge, whence, as from the Almshouses,

they are bound apprentices in families, while other benevolent institutions and individuals are busy in promoting a juvenile emigration to the West, of exposed and destitute children, there to be absorbed healthfully and usefully into the respectable population of that teeming region. The right of parental control is a natural one, but is forfeitable when parents are derelict in duty to their children and the community, and may be superseded by the *parens patriæ*. (4 Whar. Rep. 11.) It is under this principle, sanctioned by the Supreme Court of the State of Pennsylvania, that vicious youth are placed in the House of Refuge, to be removed from temptation, and put under training and apprenticeship, to fit them for usefulness in society.

Parents should consider that they cannot think too highly of their privileges and responsibilities in respect to the public provisions made for the education of their children. None can say that within their own little family may not be cast those minds who are to be the benefactors of mankind and the light of the world, and that as well in the families of the poor as of the rich. "God is no respecter of persons." Great, then, is the privilege available to all, to have the provided means of developing the intellect that may afterwards self-achieve an endless good and undying renown. No parents, poor or rich, can say that there shall not be found among their little ones a future Augustine or Fenelon, a Galileo or Newton, a Luther or Latimer, a Franklin or Washington.

The law has long entertained the highest regard for the marriage relation, and the welfare of the family. Its policy, derived from the Roman civil law, is to encourage marriages, and the rearing of children, that they may become a strength to the state. As a general rule, the law in the disposition of property, permits of no legal restraint upon marriages, except during minority, and that only for the advantage of the inexperienced and the immature in judgment. Conditions annexed to legacies against marriage, are simply void, and the legacies absolute. The law's policy regards with disfavor the interference of any mercenary agency, and declares void all contracts of marriage brokage. Its policy seeks that all influences shall be pure that are to lead to a consummation so holy as marriage; one that so much concerns the public welfare and private happiness. The law desires that mutual affection, alone, should be its attraction; and then there is a natural guarantee for the mutual happiness of the parents, and a faithful nurture and education of the children of the Republic. In this, as in all questions of wise public policy and pure morals, the

ethics of the Judiciary are perfect, and their rule inexorably applied. No man can successfully assert a claim in a court of justice through a wrong, or gain a case that is against sound public policy, or is infected by the taint of immorality.

While the law encourages marriages, its policy is not to encourage thriftless and unhappy marriages. These do not attain its desire any more than that of the parties concerned. It should be its policy, and the present improving public opinion that will in the future dictate its policy is, that women shall so share in industrial pursuits, that those single may both feel and be so independent as not to feel coerced, by circumstances, into unsuitable or improvident marriages. To this end the philanthropy of our age and country is largely engaged. The result will naturally be, that by making women more independent in character and circumstances, they will not only be rescued from a temptation to err, but be rescued from the dreary inanity of want of occupation, and become objects more worthy to be made, therefore more sure to be made, honored companions in lawful wedlock.

The common law of England was so much founded in a feudal and military policy, and in the necessity of a single head to represent the rights and duties of the family, that the legal existence of the wife was considered as merged in that of the husband. In the law they were one person, so that if lands were conveyed to husband and wife and their heirs, the survivor, as the continuation of that person, had the fee. By marriage the husband had an estate in the wife's lands as long as both lived, and if they had issue, he had a life estate, to continue after her decease, by the curtesy of England; and by marriage he became owner of her personal property. All this has been defended and maintained down to a recent date, as requisite to the necessary authority to be maintained in the head for the welfare of the family; but it assumes that the wife could not be trusted to exercise a sound discretion, or possess that affectionate interest in the welfare of all the members of her family, to induce her to make a wise disposition of her revenues for their common advantage and advancement. There are many instances where such distrust will be justified, but they are the instances to be avoided by wise and discreet men, who are seeking the wife to be the mother of their children. As the rule, it may be assumed that the wife and mother will be ever ready to give her income for the family wants, and is often but too ready to yield the capital also. The vicissitudes of business are such that it often occurs that the wife's property affords the happily

retained resource for rearing the family in respectability, when the husband's property has been swept away by the resistless tide of a commercial crisis, or, perhaps, been lost by his own indiscretions, not to say, his vices. Experience teaches, as the rule, that the wife's property should be settled to the separate use of herself and children, with such control over it, after her death, vested in the surviving husband, as will hold a worthy father in the respect of his children, and give him a salutary control over them.

Deeds of settlement, or trusts created by will, in times past, held the wife's property to her separate use; and these are yet the only safe reliance. It is true, recent legislation, in many of the States, declares that her property shall remain hers after marriage as before, and be subject to her own disposal by will, to which he must not be a witness, and it is not liable for his debts, during her life. This is well; yet is she exposed to an undue influence, and a coercion that the magistrate cannot probe. She cannot convey her property by deed without the husband joining with her, nor without herself undergoing a separate judicial examination. That is, she is not to convey without him, that she may have his protection against the imposition of others; nor without the judicial examination separate from him, that she may have the magistrate's protection against her husband's quite possible undue influence. The proceeds of the sale she may give to him in the absence of a trust. Each can dispose of his or her property separately by will, but with this exception, that the will of a husband is subject to the widow's right of election to reject the will, and in lieu of its provisions, take one-third of his real estate for life, if he leave issue, and one-third of the personalty forever; and if he died without any issue, her right of election will extend to one-half of his estate for such durations of time; and the wife's power of disposition of her property by will, is subject to his estate for life in the whole of her realty, and to his right to take in lieu of curtesy such share of her real and personal estate as she could have taken of his real and personal estate; that is, one-third or one-half, accordingly as she left issue or not, and for the same duration, of time. But her property held in trust would only go according to the limitations of the trust; or to the dispositions made under the powers expressly reserved or given to her by the trust instrument. A firm trustee is a great assistance to her in the preservation of her property, if her dispositions be required to be made with his consent.

It has been the good fortune of the writer to be enabled to effect legislation, to some extent, for the further benefit of the wife and

family. It is now the law of Pennsylvania, that whensoever any husband, from drunkenness, profligacy, or other cause, shall neglect or refuse to provide for his wife, or shall desert her, she shall have all the rights and privileges of a *feme sole* trader; that is, shall have ability, as a single woman, to make contracts and carry on business; and her property, real and personal, shall be subject to her free and absolute disposal during life, or by will, without any liability to be interfered with, or obtained by such husband, and in case of her intestacy, it shall go to her next of kin, as if he were previously dead. The mother is substituted to his former rights over their children, and she is to assume his duties; place them in employment and receive their earnings, and bind them apprentices; provided she be worthy of the trust, and the Court shall decree her this independent *status;* otherwise the Court is to appoint a guardian for the children. And no such husband, who shall have refused to provide for his children, for the year preceding his death, shall have the right to appoint for them a testamentary guardian. (Act of May 4, 1855.) Again, it had been the hardship of a deserted wife, that her own earnings might be recovered by her worthless husband; and he might himself be, or prompt another to be, her defamer, and yet she could maintain no action for redress, without its being in his name and subject to his control; for remedy whereof it is enacted, that the deserted wife, in case of defamation, or suit for her earnings, may maintain the action; and if her husband be the defendant in an action of defamation, she may sue in the name of a next friend. (Act April 11, 1856.) Thus the unworthy husband and father may forfeit his high position, and the worthy wife replace him in it. This righteous legislation came only after ages and centuries of injustice and wrong, and so far as known to the writer, only yet exists in one of these States.

It is the unhappiness of some persons, married and unmarried, to have no children on whom to bestow their care and affections, while others have more than they can conveniently provide for and educate; and there are often orphans without relatives to provide for them. It is provided by a section of the Act of 1855, that persons, by certain judicial proceedings, may adopt a child or children, and give them their names and all the rights of heirs, and the parties become, with reciprocal claims and rights, subject to all the duties of parents and child. This law may often fill a void in the family needful to its happiness, tend to equalize the blessings of life and fortune, and prove of inestimable advantage to orphans and other children destitute of provision. The natural parental and maternal love unblessed

by offspring may thus be satisfied, and life become a higher blessing to the adopting parents, by the consciousness of doing a present and future good, to unprovided and helpless children.

As great as are the advantages of marriage, and sacred as are its ties, the law cannot do less, from sheer humanity, than relieve the innocent party by divorce, when the other has so grievously violated the conditions of the compact, as to make the continuance of the relation a participation in guilt, or so oppressive as to make life burdensome or an intolerable slavery. The wrong would in such case be, to coerce a cohabitation, when it would be productive of consequences precisely the reverse of those intended by the institution. If either party has, by vicious habits, alienated him or herself from the duties that he or she engaged to fulfil, and has violated the solemn marriage promises and obligations, he or she is no longer one joined by God, but is already dissevered; therefore, the law says, as to those whom the Lord doth not longer join together, let man put asunder. In ancient times, except among the German nations, the husband generally divorced the wife at his pleasure or caprice, by himself giving her a writing of divorcement; a power permitted the Jews by the law of Moses, as our Saviour said, because of the hardness of their hearts; but in Christian countries the power is only exerted by law, for causes reciprocally operative against a husband or wife, who has forfeited the marriage rights by a violation of its duties.

But, I repeat, it is not to law so much as to other influences that we are to look for human improvement through the family. These must be moral and religious influences. And is there not in these a philosophy fittingly to be spoken of in this Hall? The science that teaches us how to live and how to die must be the most important of philosophies; and the science is as sure and logical in its laws of cause and effect as any other science; and is so much the more important than any other, that it the most nearly concerns human happiness. It may be said, perhaps truly, that there can be little or nothing that is new to be disclosed in morals and religion. Though that should be conceded, one thing remains to be certain, that as long as we live we can always be advancing towards that standard of perfection, that we are bidden to strive to attain; a standard that we may but hope to approximate; a measure of improvement which the most civilized nation has not yet half fulfilled. From this delinquency the recovery must mainly be through the better training and education of the family.

But following from habit and example in the steps of our predecessors, we take too little thought of the capacities of improvement in ourselves and families. And though there seems to be little scope for an increase of learning in morals and religion, there is always great room for practical improvement. Each individual may ceaselessly increase his knowledge and improve his social manners and affections; and multiply the applications of known truths; and in every step of this progress other truths will dawn upon the mind with ceaseless increase of light and of the joy of life. Let not then the familiarity of the subject make us forgetful of the duty of observation, reflection, and advancement, in this small, ever present, and always interesting centre, but of ceaselessly expanding influence and power, the family.

In dwelling upon this familiar subject I have been led to consider how prone are mankind to overlook the significance of things most commonly present to them; and though the subject in hand may not admit of scientific discovery, yet the moral consequences to result from a better understanding of it, may so far surpass in practical benefits the most brilliant discoveries in physical science, as to make our labors in this field of practically the greatest importance to mankind. Physical discoveries are always most valuable; and if seemingly for nothing else, are so in the discovery of the Creative wisdom; but in practical purpose rise in importance as they minister to human welfare. Let us illustrate by a few instances how blind mankind have been to things the most familiar to them; as to which philosophers, some of them our predecessors in this Society, have made discoveries which have conferred glory upon their names and upon philosophy. All men, through all the lapse of time since men peopled the earth, had beheld the light with admiration, praise, and even worship; but thought it a simple element, until Newton analyzed its rays into the prismatic colors, although they had seen their prismatic separations as refracted by the atmosphere, before the rising and after the setting of the sun of every unclouded day, through all the ages of human existence. Men had always breathed this atmosphere, upon which we hang at every moment for its life-giving inspiration, and in all time they had supposed it to be another simple element, until our Dr. Priestley, in but the past generation, separated its simpler elements, and found one of its gases to be that which sustains alike combustion and life; the other to dilute that burning oxygen that else would destroy all life. The water, which all men drank as another necessity of life, they supposed to be another ele-

ment of nature, given as the conquering enemy of fire, was also divided into its constituent gases, and these, as recombined by the compound blowpipe of our Dr. Hare, produced a heat hotter than the thrice heated anthracite furnace. The lightning, which all mankind, of all ages, had beheld with wonder and superstitious awe, as it flashed through the skies, leaping from cloud to cloud and from heaven to earth, detonating in stunning thunders, was proved by our Dr. Franklin, as he drew it harmlessly from the sky, to be electricity; and now men make it bear their messages of business and command, with the lightning's speed, over this globe. And we see it, in this our day and country, performing duties of mightiest potency, since from the central capital it carries the commands that move the distant armies spread over our wide continent, in that concert of action that insures victory and safety to the legitimate Government of the nation.

These are discoveries most interesting, most useful, most brilliant; and no such discovery and renown can reward the reflections of him who devotes himself to the social, moral, and religious improvement of his fellow men. Yet let not the legist, moralist, or the preacher, be discouraged, but console himself in this, that whatsoever good he may do shall achieve a success in a domain of yet higher import than all physical discoveries; that he may elevate the moral standard of humanity, and create a virtue and happiness that shall belong to two existences. If mankind shall fail in these, then will they fail in the highest purpose of the Creator, and make creation itself a failure. If this shall be the event, what then shall import all wealth, all power, all science, all knowledge? what this air we breathe, this earth we tread, and all its fruits; its bright waters, its glorious light and electrical coruscations; all that shall sustain all life, and all that shall yield to the physical philosophers their rich harvests of glory? They become worthless all, if man shall betray his highest trust and fall. If man prove worthless, these are worthless all! Truly, then, there is a philosophy that transcends and comprehends all other philosophies, the philosophy that teaches man how to live and how to die.

On motion of Mr. Fraley, Mr. Lesley was chosen Librarian for the ensuing year.

The Standing Committees for the year were then appointed, as follows:

Committee on Finance.—Mr. Fraley, Mr. J. F. James, Mr. Powel.

Committee on Publication.—Dr. Bridges, Mr. T. P. James, Dr. Ed. Hartshorne, Prof. Coppée, Dr. Wistar.

Committee on Hall.—Mr. F. Peale, Judge King, Prof. Coppée.

Committee on Library.—Dr. Bell, Rev. Dr. Stevens, Dr. Coates, Mr. Price, Rev. Mr. Barnes.

The list of surviving members was read, and corrected by the announcement of the death of Prof. Joseph S. Hubbard.

Summary.

On the List, Jan. 7, 1863, ...	U. S., 255,	Foreign,	136
Elected in the year 1863, ...	U. S., 24,	"	16
Deceased reported in 1863, ...	U. S., 12,	"	4
Number of members, Dec. 31, 1863,	U. S., 267,	"	148

Pending nominations, Nos. 506, 507, and new nomination 508, were read.

The Society then proceeded to ballot for members, and the ballot boxes being opened by the President, the following persons were declared duly elected members of the Society.

Prof. A. Morlot, of Lausanne, Switzerland.

Prof. Thomas Chase, of Haverford, Pennsylvania.

And the Society was adjourned.

Stated Meeting, February 5, 1864.

Present, twenty-one members.

Dr. Wood, President, in the Chair.

Letters accepting membership were received from Prof. Thompson, dated Copenhagen, November 11, 1863, and from Prof. De Koninck, dated Liège, January 15, 1864.

A letter was read from the Royal Society, dated London, January 7, 1864, requesting the co-operation of this Society in completing or making as perfect as possible the Catalogue

of Scientific Memoirs, for some time in course of preparation by the Royal Society, and now nearly ready for publication. A list of Journals and Transactions of societies included in the Index accompanied the letter.

Letters acknowledging the receipt of publications were read from the London Geological Society, November 4, 1863; the Royal Astronomical Society, London, October 17; the Scientific Commission of the Royal Zoological Society of Amsterdam, August 25; Mr. Troyon, of Lausanne, August 7; the Royal Academy at Turin, August 11, and the Royal Saxon Society at Leipsig, October 10, 1863.

Letters announcing or accompanying donations for the Library were received from the Harvard Observatory, January 20, 1864; the Royal Geological Society, London, November 20, 1863; the Royal Zoological Society at Amsterdam, August 25; the Royal Saxon Society, Leipsig, August 22 and 29, and the Imperial Academy at Vienna, August 25, 1863.

Donations for the Library were announced from the Academy at St. Petersburg; the Central Russian Observatory; the German Geological Society; the Royal Saxon Society; the Imperial Geological Institute and Imperial Academy at Vienna; the New Astronomical Society at Heidelburg; the Royal Zoological Society at Amsterdam; the Geographical Society, and M. Delesse, at Paris; M. Des Moulins, of Bordeaux; The Royal Academy at Turin; the Royal Society, Royal Institution, Royal Astronomical, Royal Zoological, Chemical, and Linnean Societies, and Society of Arts, of London; the Bath Agricultural Society; the Royal Dublin Society; Harvard College; Mr. G. P. Bond; the American Academy; the Boston Society of Natural History; the American Journal of Science; the Academy of Natural Sciences; Mr. F. Leypoldt, Messrs. Blanchard and Lea, and Mr. Isaac Lea, of Philadelphia; Mr. T. U. Walter, of Washington, and Mr. A. S. Taylor, of San Francisco.

Donations of photographs for the Album were reported as follows: two of Richard Lepsius, one of L. De Koninck, one of David's bust of Humboldt, one of J. F. Encke, one of M. Troyon, one of Leopold Von Buch, and one of M. Delesse.

Mr. Price continued the reading of his communication upon "The Family as an Element of Government."

Pending nomination No. 508 was read.

The letter of the Secretary of the Royal Society was then considered, and on motion, the subject was referred to the Secretaries, with power to act.

And the Society was adjourned.

Stated Meeting, February 19, 1864.

Present, fifteen members.

Dr. Wood, President, in the Chair.

A letter accepting membership was received from Thomas Chase, dated West Haverford, February 18th, 1864.

Letters acknowledging the receipt of publications were received from the German Geological Society, Berlin, November 5th, and the University of Toronto, February 8th, 1864, and a photograph of Mr. Fraley for the Album.

Donations for the Library were received from the Vaudois Society of Sciences, and the Museum at Cambridge, Massachusetts.

An obituary notice of Dr. Darlington was read by Mr. T. P. James.

AN OBITUARY NOTICE OF DR. WILLIAM DARLINGTON,

Read before the American Philosophical Society, February 19th, 1864, by Mr. T. P. James.

The usual reproach charged upon scientific men, of unfitness for the duties of practical life, cannot be urged against the subject of this sketch, for versatility of talents, joined with great executive ability, caused his opinion to be eagerly sought for, and his judgment highly valued.

William Darlington in early life had few educational advantages; possessing, however, energy of character and great perseverance, he was enabled by his fondness for study to enrich his mind with lore from the writings of the best authors in most of the ancient and modern languages. He had the rare faculty of improving every

opportunity for acquiring knowledge; his childlike humility was apparent even in advanced age, and he never felt himself too old to learn or too wise to accept the gleanings of other minds.

When we consider his kind and benevolent disposition, social habits, and genial manners, it is not surprising that his loss is deeply mourned by numerous friends, and a large circle of acquaintances and correspondents, not only in this country but in Europe.

He was elected a member of the American Philosophical Society forty years ago, and was among the oldest surviving members. His life-long devotion to science and important public services have rendered his name honored and his memory deserving a tribute of respect.

Our attention will be chiefly directed to his character as a botanist, for it is that side of his full-orbed life which is most interesting to us, and by which he has been most widely known.

Some knowledge of his history and early life may be gleaned from the following extract from a manuscript autobiography in my possession, and will serve to illustrate the preceding remarks:

"My great grandfather, Abraham Darlington, was a contemporary of William Penn; and being of the same religious persuasion, followed him to his province of Pennsylvania near the close of the seventeenth century.

"He first settled near Chester, a village on the right bank of the River Delaware, and the oldest town in Pennsylvania. His letters from his parents in England are dated from Darn Hall in Cheshire. He afterwards removed to the banks of the Brandywine, our classical stream in Chester County, where he continued to reside until his death. His son Thomas, my grandfather, married Hannah Brinton, the daughter of a Quaker family, which also came with William Penn. Their eldest son, Edward Darlington, my father, was married to Hannah Townsend, daughter of another old English family of Quakers, which had sought a refuge in Penn's province.* I was born on the 28th day of April, 1782, and so far as I can trace my

* It would not be inappropriate here to allude to an occurrence of recent date, the sesqui-centennial gathering of the clan Darlington, which rallied at East Bradford, Chester County, the residence of Brinton Darlington, grandson of the first American progenitor, on the 20th August, 1853, at the call of some of the elders of the tribe, where nearly four hundred, old and young, assembled at the appointed time and enjoyed the happy reunion. On which occasion it was ascertained that the total number of descendants of Abraham Darlington amounted to one thousand five hundred and twenty-four.

ancestry on both sides, I may say that my blood is purely Anglican, without a cross.

"My father inherited a farm from his maternal grandfather. It is situated in the Township of Birmingham, five miles south of West Chester, about midway between the two localities on which the battle of Brandywine was fought. On that farm I was born and brought up until I nearly completed my eighteenth year. I was the eldest son, and being designed for a farmer, I was put to all sorts of agricultural labor as I became capable of it. I was not permitted to go to school, except in the winter season, after I was thirteen years old; and yet I manifested at an early age a much greater fondness for books than hard work!

"My mother taught me to read while I was quite young; and I recollect often hearing the dear old lady tell the neighbor women that her Billy had read the Bible through before he was six years old.

"Before I was eighteen I had conceived such an aversion to the uninteresting drudgery of the farm, and felt such a desire to engage in some kind of study or scientific pursuit, that my father consented to let me study medicine, which was the profession I selected, on account of its connection with the most interesting natural sciences.

"Accordingly, on the 1st of April, 1800, I commenced the study of medicine, in Wilmington, Delaware, with Dr. John Vaughan, a respectable physician of that place. In the autumn of that year I began the study of the French language with an accomplished scholar.

"In 1802, I became conscious of a taste for botanical researches, which was awakened by the perusal of Darwin's Botanic Garden, but there was no one then in Wilmington to aid me, and I made little progress. In the autumn of that year, Wilmington was visited by the malignant yellow fever; such was its mortality and the consequent dismay, that all the physicians, except my preceptor, ingloriously fled; he, and I, his humble student, were the only medical personages who staid to attend the sick; we persevered through an arduous and anxious season, and were mercifully favored to escape the disease.

"In November, 1802, I repaired to Philadelphia, to attend the medical lectures in the University of Pennsylvania, where I was favored to become familiarly acquainted with Prof. B. S. Barton, who discovering in me a considerable fondness for the study of plants, took me under his special patronage, and by his kind attention and instruction gave a decided bias to my future pursuits. A society was

formed that winter, called the American Linnæan Society, of which Prof. Barton was president, and it did me the unexpected, not to say unmerited honor, of enrolling me among the members.

"At the conclusion of the course of lectures, I returned to the office of my preceptor in Wilmington, where I passed the summer in his service, but in the following November, went again to Philadelphia, to attend my second course. I became a member of the Philadelphia Medical Society, and applied myself diligently to prepare for the degree of Doctor of Medicine, being the first candidate from Chester County, so far as I know, who had then aspired to that honor.

"I passed a satisfactory examination for my degree, in March, 1804, and as the commencement that year did not take place until the beginning of June, I remained in the city to prepare and print my inaugural thesis, and especially to attend a course of lectures on Botany, by Prof. Barton.

"The Professor occasionally took his small class to the Bartram Botanic Garden, to illustrate practically some of his teachings, and these were my earliest visits to that interesting spot. William Bartram and John Bartram, Jr., were then living there, and distinctly do I recollect the venerable men, though I little dreamt I should one day have so much to do with the history of the family.

"The candidates for the medical degree of Doctor were publicly examined before the Trustees and Faculty of the University, on the merits of their several Theses.

"The subject of mine was, the 'Mutual Influence of Habit and Disease.' It fell within the province of Prof. Rush to examine it. As I had the good luck to advocate the favorite doctrines of the Professor in that essay, I got off very handsomely. Instead of putting me on the defensive, as several of my companions had been, the Doctor called me up, and addressing the Trustees and Faculty said, 'This dissertation, gentlemen, is a successful application of metaphysics to the practice of physic. I have read it twice through with attention, and have no objection to make to it.' I then had nothing to do but make my bow and sit down. A very talented gentleman from Virginia, vastly my superior, who sat immediately before me, and had just been severely questioned on some of the doctrines of his thesis, turned round and laughingly asked, 'Darlington, is that what you call defending your thesis?' On the following day I received my diploma, and returned to my father's dwelling to reside, after an absence of four years. Here I loitered away my time in a

limited country practice, and in the study of Latin, for, when I received my diploma, I could not read a word of it, and my pride was piqued and my ambition excited to get rid of that opprobrium. I took lessons of a private tutor for a few weeks, and then set to work myself until I made considerable progress. Thus I passed my time for two years, moping in rural solitude over my grammar and dictionary, when not riding to see a patient; but I became discontented with my humdrum existence as a country practitioner, and at length resolved to abandon my rustic home for a life of more excitement and interest. I therefore engaged myself as surgeon of an East India ship bound to Calcutta. After a long and tedious voyage of five months in a leaking ship we landed safely at Calcutta. I went ashore to reside, and being curious in the study of language, I procured a grammar and forthwith commenced the acquisition of the spoken jargon, as it is termed, of Bengal. We remained two months in port, during which time I spent two delightful days in the East India Company's Botanic Garden, and made the acquaintance of Dr. Wallich, its director, the well-known botanist. After an absence of thirteen months I reached my native land."

Some years after his return, he prepared, from his journal and memory, an account of his India voyage, in a series of letters from Calcutta, which may be found in the 13th and 14th volumes of the Analectic Magazine.

Dr. Darlington in his younger days was a man of social habits, and a cheerful companion in the several societies of which he was a member, and much given to poetry and rhyming. Many of his songs were written for the amusement of his associates, and, as he had a good voice, were always sung by him with eclat. A number of these rhymes found their way to the public in the periodicals of the day.

On the 1st of June, 1808, he married Catharine, daughter of General Lacey, of New Jersey, an officer of the Revolutionary War, and settled in West Chester, at that time a small hamlet, to practise medicine, in which pursuit he was successful, and maintained a high position in the profession. For self-improvement he studied the German language under a private tutor, and soon acquired a knowledge of German literature.

In 1813, he began to devote more especially his leisure hours to botanical investigations, with a view of preparing a catalogue of the phænogamous plants growing in the vicinity of West Chester, but his peaceful occupation was interrupted by the war then raging with Great Britain, and although educated in the tenets of the Society

of Friends, he became imbued with the spirit of a soldier and actually took up arms in defence of his country, and rose to the rank of major of a regiment. Having acquired a military taste, he aided in keeping it alive among his associates. A few years later he was elected a lieutenant colonel of a battalion of volunteers, and afterwards colonel of a regiment, and commanded the escort to General Lafayette on his visit to Chester County and the battle-fields of the Brandywine. During his military ardor his muse took a patriotic flight, and his effusions were much in vogue in those stirring times, and served greatly to elicit enthusiasm among the yeomanry of Chester. Their gatherings were elivened with many of his songs.

While serving in the field he received notice of his election to the national legislature. Soon after taking his seat as a member of the 14th Congress, he composed and sung, at a dinner given on the 8th of January, 1816, by the Pennsylvania delegation, to Commodores Decatur and Stewart and Captain Biddle, of the Navy, the "Yankee Tars,"—a song commemorative of our naval victories, and historic of the deeds of the brave men of that day. This song was published in the leading journals, and received merited encomiums.

Dr. Darlington was re-elected a member of Congress in 1818, also in 1820, and ever faithful to his trust, was rarely absent from his seat.

He made a memorable speech in favor of restricting slavery in the State of Missouri, as preliminary to her admittance as a member of the Union, which was published in the National Intelligencer, and in Niles's Register, where he remarks, it is preserved "like a fly in amber." This speech did infinite credit to his head and heart, and was a subject on which he ever felt strong convictions of the truth of his views.

In recent exciting events he took a lively interest, and at the outbreak of the rebellion his loyalty to the Union was strongly manifested, in bringing his entire influence to bear in upholding the position of the Government, and he remarked, that had he been younger, he would again have unsheathed his sword in defence of his country.

In the summer of 1817 he began in earnest to prepare his work, and at the suggestion of his friend, Dr. Baldwin, to collect an herbarium of the plants of Chester County, as an indispensable means of determining the species; but his attention was much diverted from a vigorous prosecution, by various trusts and public services. Still, his duty to his first love would prevail, and lead him back to his agreeable labor.

Although he commenced the Enumeration in 1813, it was not fully elaborated for the press until the winter of 1824–25. Its issue was retarded, in the meantime, on account of the appearance of Pursh's valuable Flora, and subsequent publication of Nuttall's excellent work on the North American Genera, but more especially of Dr. Barton's Flora Philadelphica, which latter comprised the greater portion of the plants of his district; all seeming to him to supersede the utility of his project, and, for a time, he relinquished the idea of printing the work.

Believing, however, in the good results of local Floras in the development of science, he brought his labor to a close.

In the ardor of the pursuit of his object, he had the satisfaction of communicating a taste for botanical investigations to a number of the intelligent gentlemen of his vicinity, who, in return, afforded him assistance in his work.

The Enumeration was published under the title of "Florula Cestrica." The motto adopted for the work, a line from Horace, is characteristic of the author,—"Ore trahit quodcunque potest atque addit acervo."

In 1837 he published the Flora Cestrica, a more extended work, being an attempt to enumerate and describe the flowering and filicoid plants of Chester County, Pennsylvania, adopting the Linnæan arrangement, whilst the modern botanical world had so generally abandoned it for the natural method. He considered the latter as yet not sufficiently established in its details for his purposes, although freely admitting that the true science of vegetables could only be attained by a philosophical investigation of their structure, functions, and natural affinities; yet he could not help thinking that even the superficial knowledge of genera and species so readily acquired by the Linnæan system, of advantage to the learner, by exciting an early interest and facilitating his first steps. Of this edition, it must be admitted, that a more comprehensive description of each species of a genus has rarely been given to the public in this country.

A third edition of the Flora Cestrica appeared in 1853, arranged throughout according to the natural system, to which was added those plants which had been found to exist in the County since the preceding one was published, and it was extended so as to embrace the Anophytes and the Thallophytes. The author contemplated, when this revised edition was commenced, to have inserted a brief description of all the indigenous species of the Vegetable Kingdom which had been detected in the County, together with such introduced

plants as had become naturalized, or were cultivated for useful purposes, but it became apparent that the still lower orders, especially the Fungi, which are so multitudinous, would render the volume inconveniently large.

Of this work, we have the highest authority for asserting that it is "one of the best local Floras ever written." It has become a handbook for all lovers of the "amiable science" in his native State, and the clear and minutely accurate descriptions of the plants enumerated, will always render it a valuable assistant to the botanist.

Dr. Darlington was so strongly impressed with the great importance of a knowledge of botany, to almost all classes of the community, that he let no opportunity pass without expatiating upon its advantages; he regarded its utility great, in reference to mental discipline, intellectual qualification, and practical usefulness. He seemed to think it impossible for any one endowed with the common attributes of humanity to avoid being, to a partial extent, at least, a naturalist; in his opinion, no education could be deemed complete without some acquaintance with the rudiments or first principles of botanical science, some rational knowledge of the multiform creation around us, known as the Vegetable Kingdom. To the agriculturist, he considered such information indispensable; and with these views, he compiled and published, in 1847, an Agricultural Botany, an enumeration and description of the useful plants and weeds which merit the notice or require the attention of American farmers. The beneficial influence of the circulation of this useful volume in Chester County is evident from the disappearance of those pestiferous weeds which have followed the footsteps of civilization from the old world to the new. In compiling this work, he found it somewhat difficult to determine, satisfactorily, the line of demarcation between plants entitled to a place, and those which might properly be omitted; but it must be admitted that he has happily succeeded in the selection of plants for the object he had in view.

In 1819 Dr. Darlington opened a correspondence with the veteran botanist, Prof. De Candolle, of Geneva, and sent him a package of American plants, which procured him a polite return, and doubtless, in 1824, the honor of a genus dedicated to his name; this genus was afterwards found, by Mr. Bentham, to be a Dismanthus, and so it was cancelled.

Many years later, Dr. Torrey, unwilling that the labors of this Nestor of American botanists should not be suitably commemorated,

at first indicated a genus to his name of a Californian plant on imperfect specimens, but upon obtaining good flowering plants, it proved to be only a species of Styrax. (Styrax Californica, n. sp.)

Nothing daunted, however, Dr. Torrey determined that there should be established a genus suitable to such an honor, and seized the opportunity of dedicating a new pitcher plant, detected in Upper Sacramento, California, which proved to be generically distinct from Sarracenia, as well as Heliamphora, and which he remarks, "I take pleasure in dedicating it to my highly esteemed friend, Dr. William Darlington, of West Chester, in Pennsylvania, whose valuable botanical works have contributed so largely to the scientific reputation of our country." And thus it now stands firmly established, the *Darlingtonia*, with one species thus far known, the *Californica*. He was very desirous of seeing a living specimen of this plant, but his wish was not gatified; he, however, had the satisfaction of knowing, a few days prior to his decease, that Dr. Gray had succeeded in raising a plant from seed, at the botanic garden at Cambridge.

Dr. Darlington projected a Natural History Society, which, in conjunction with a few friends, was organized on the 18th of March, 1826, by the name of the Chester County Cabinet of Natural Science, to which institution he was elected president, filling that office during his life. For thirty-seven years he labored assiduously for its welfare, devoting much time and energy by addresses and writings to awaken a general interest in the subjects connected with it. Drawing around him a few congenial spirits, he hoped to illustrate thoroughly the natural history of his native county, taking for his model White's History of Selborne, which he particularly admired. This plan has been partially carried out, and collections made, but only the botanical portion has been published.

He bequeathed to this institution his valuable library of botanical books and his Herbarium, containing the treasures of his life-long labors in that science. This he rearranged only a few years ago, adding the synonymes of each plant, thus facilitating the research of future botanists. He asserted that its eight thousand species were so completely catalogued and arranged according to their natural affinities, that any one of them could be promptly exhibited on demand.

He was chosen President of the Chester County Athenæum, in 1831, and by his services rendered that institution valuable assistance.

Making the acquaintance of a Castilian gentleman, residing in

West Chester, in 1832, he studied under his instructions the Spanish language, and took delight in perusing many works of celebrity in that tongue.

Dr. Darlington's interest in the botanists of his native State, induced him to compile selections from the correspondence, with occasional notes and a biographical sketch of his intimate friend and classmate, the late William Baldwin, M.D., Surgeon in the United States Navy, who died whilst on an expedition up the Missouri, under Major Long, which he published in 1843, under the title of Reliquiæ Baldwinianæ.

A few years afterwards, from the materials put into his hands, he collected the correspondence of two of the early and venerable pioneers of botany in Pennsylvania, to which he appended a brief notice of the life of each, and published them in 1849, in one large volume, as the Memorials of John Bartram and Humphry Marshall, with notices of their botanical contemporaries.

In these worthies of a former generation he was deeply interested, and alluded to himself with his usual humility of his own name going down to posterity as an epiphyte clinging to their sturdy branches. Much credit must be accorded to him for the patient perseverance in rescuing from oblivion these very interesting letters, many of them written by the most distinguished European botanists of Linnæus's time, and comprising some of the epistolary correspondence of the two venerable Pennsylvanians, and which the editor persuades himself that the lovers of nature and admirers of native worth amongst us will regard with interest.

Humphry Marshall, it is believed, published the first truly indigenous botanical essay in this Western hemisphere. It appeared in the year 1785, in the form of a duodecimo of about two hundred pages, under the title of Arbustum Americanum, the American Grove, and is dedicated to the officers and members of the American Philosophical Society.

Among Dr. Darlington's contributions to the history of his native State must be mentioned an interesting paper on the famous "Mason and Dixon's line." He has given an excellent account of this memorable controversy between Lord Baltimore and the family of Penn, which lasted from 1682 to 1767.

From his untiring research and extreme accuracy in detail, he was well fitted for an antiquarian, but the ever-open book of nature, whose hieroglyphics he tried to elucidate and expound, had higher claims to him than old manuscripts and musty tomes.

During the last few years of his life he was engaged in preparing the "Notæ Cestrienses," a series of memoirs of the men of Chester, published in a periodical of the county. He left in the hands of his friend J. Futhey Smith, voluminous MS. materials for the history of Chester County, which it is to be hoped will be speedily published.

His last work, completed a few months before his death, was a paper on "The Weeds Injurious to Agriculture in the United States," for the Agricultural Bureau, and will appear in the next volume of reports.

At the organization of the Chester County Medical Society in 1828, although he had relinquished the practice of medicine for nearly twenty years, yet such was the estimation he was held among the profession, that he was elected president, which position he held at his death.

In 1848, the degree of Doctor of Laws was conferred on him by Yale College; and he was a member of more than forty literary and scientific societies.

To exhibit Dr. Darlington's comprehensive talent, it would be proper to state that he took an active part in establishing the Bank of Chester County, and was continued a director from its origin until his death, and president for more than thirty years. He held various appointments from the Governor, Prothonotary of the County, Canal Commissioner, and for a term President of the Board. He was the prime mover in establishing the Agricultural and Horticultural Societies of the county, and the West Chester Railroad, and for a time a Director and President of the Company. In fact, every public improvement projected within his native county or town, appears to have originated with him, or found in him an active coadjutor. He took great pains in securing beauty of design and symmetry of form in the public buildings of West Chester, and a prominent part in the improvement of the public park, selecting the trees with care, and planning this small arboretum, which in time will be the resort of those who wish to study the form and growth of our native trees.

Dr. Darlington held during his life many important political offices, and the following remark in his biography, merits the attention of office-seekers of the present day. "I have been some ten years in public service, by election and executive appointment, and can truly say that I never asked for an office; nor as much as insinuated to any one that I would like to have his vote and interest for one. I always took it for granted that every man who wished to vote for me would do so without solicitation; and if he did not wish it, I was too proud to solicit it."

He was ever ready and always disposed to contribute to the advancement of any literary or scientific enterprise by public addresses and lectures, and he was frequently called upon for such gratuitous labor. More than twenty addresses, mostly upon botanical science or kindred subjects, were delivered by him, on various occasions, and afterwards published. His constant desire was to educate the public mind to a love of scientific pursuits, he therefore lost no opportunity of communicating his own zeal to the young around him.

In the spring of 1862, Dr. Darlington was attacked by paralysis, from which he partially recovered, but the following winter another stroke rendered him helpless, and he gradually declined, until the 23d of April, 1863, when he quietly expired at the advanced age of nearly eighty-one, in the town of West Chester, and only a few miles distant from his birthplace.

Twenty years before his death, he wrote his own epitaph, as he remarks, in his biography, "I had a desire to prevent the partiality of surviving friends from resorting to commonplace cemetrical eulogy, and yet had a wish for some botanical allusion, to meet the eye of any lover of plants who might happen to visit the spot while the memorial remained, so I prepared the following, which is intended as the expression of a kindly wish or ejaculation on the part of the future botanist who may see and recite it as he rambles by. It is to be an isolated paragraph below the name and dates, thus:

PLANTAE CESTRIENSES,
QUAS
DILEXIT ATQUE ILLUSTRAVIT,
SUPER TUMULUM EJUS,
SEMPER FLOREANT!"

His remains repose in a secluded part of the beautiful Oaklands Cemetery of West Chester, to which they were borne by a crowd of his sorrowing neighbors, on the Sunday following his decease. He was mourned not only as a public benefactor, but as a friend, kind, affectionate, and charitable, a consistent communicant of the Episcopal Church, a truly Christian gentleman, in whose death each felt a personal loss. A wise man, his literary attainments and learning were never obtrusively thrust forward; the humblest listener separated charmed by his simplicity of manner and quaintness of conversation: thus he made friends of all, yet in his quiet dignity he seemed the

father and patriarch of the beautiful town he had for fifty-five years watched over, and with which his name will ever be identified.

I will close this tribute to a tried and faithful friend with a quotation he has on a like occasion adopted.

—— "Manibus date lilia plenis:
Purpureos spargam flores, animamque Amici
His saltem accumulem donis, et fungar inani
Munere."

"Handfuls of fresh and fragrant lilies bring,
Mixed with the purple roses of the Spring:
Let me with funeral flowers his body strew;
This mournful duty to my friend I owe,—
This unavailing gift at least I may bestow."

A letter was read from Prof. Zantedeschi, of Padua, dated January 7 6, 1864, offering for publication in the Transactions of the Society an Italian manuscript, entitled "Capo III. Dei risultamenti ottenuti da uno nuova analisi dello spectro luminoso," which on motion of Prof. Coppée was referred to a committee, consisting of Prof. Kendall, Prof. Lesley, and Dr. Bridges.

A communication was read from Mr. Buckingham Smith, dated New York, February 15th, 1864, addressed to Mr. John W. Field, 243 South 18th Street, Philadelphia, and communicated to the Society through Mr. Benjamin Gerhard, offering for publication by the Society a communication entitled "Grave Creek Mound, and certain Inscriptions on Stone, found in the Northern Atlantic States, incidental to its History," which was read by the Secretary, and after remarks by Dr. Coates, Prof. Trego. Dr. Le Conte, and Prof. Haldeman, was on motion referred to a committee consisting of Prof. Haldeman, Mr. Chase, and Dr. Le Conte.

Prof. Haldeman presented a curiously formed pebble, taken from the bottom of an excavation in the Valley of the Susquehanna, to illustrate the very artificial aspect which purely natural objects of this kind sometimes wear.

Mr. Chase referred to a paper on caloric, lately published by Mr. Colburn, and discussed its bold but violent hypothesis of the generation of the diurnal maximum of heat from the conversion of the earth's rotary velocity. Mr. Briggs

and Prof. Cresson continued the discussion, by reference to Tyndall's observations on the heat-absorbing capacity of aqueous vapor, furnishing, in fact, the only sound basis for explaining the variations of the daily climate.

The minutes of the Board of Officers and Members in Council were read.

Pending nominations 508, and new nominations 509 to 518 were read.

The bill of Pawson & Nicholson was referred to the Committee on Finance.

The Library Committee reported as follows:

At an adjourned meeting of the Library Committee, February 19th, 1864, the resolution offered at the stated meeting of the Society, October 2d, 1863, and referred to the Library Committee to report thereon, was considered, and on motion of Mr. Price the following resolution was offered to the Society, viz.: *Resolved*, That the Catalogue, as far as printed, be distributed to such as agree, by subscription, to take the whole volume of three parts, at the price fixed upon by the Society, payable when the second part shall be delivered. On motion the resolution of the Committee was agreed to by the Society.

The Society was then adjourned.

Stated Meeting, March 4, 1864.

Present, thirty-four members.

Dr. Wood, President, in the Chair.

Prof. Chase, a recently elected member, was introduced to the President, and took his seat.

A letter acknowledging the receipt of publications was received from the Natural History Society of Newcastle on Tyne, dated February 4th, 1864.

A letter respecting transmitted manuscripts was received from Prof. Zantedeschi, dated February 7th, 1864.

A letter requesting an exchange of publications was received from the Imperial Library at St. Petersburg, dated January 10–22, 1864. On motion, the Imperial Library was ordered to be placed on the list of correspondents.

A letter from Dr. Leidy to the Secretary, dated Philadelphia, February 23d, 1864, was read and referred to the Curators for action.

A letter from Prof. Haidinger to the Secretary, dated Vienna, February 9th, 1864, was read, inclosing a list of contributors to the Von Martius Festival Medal. On motion, the list was ordered to lie on the table, to afford members an opportunity to subscribe.

Donations for the Library were announced from Prof. Zantedeschi, the Royal Astronomical Society, the Essex Institute, the Academy of Natural Sciences at Philadelphia, Dr. B. H. Coates, Senator Wilson, and the National Observatory.

Photographic portraits of Leo Lesquereux, Isaac Lea, and Elias Durand, members, were presented for the Album.

The death of Prof. Edward Hitchcock, a member, at Amherst, Massachusetts, on the 27th ult., aged 70 years, was announced by the Secretary.

The Committee to which was referred the paper on Grave Creek Mound reported against its publication and were discharged, their report having been accepted and approved.

The report of the Board of Secretaries on the communication received from the Royal Society, was, on motion, adopted, as follows: 1. That they are prepared to furnish to the Royal Society a supplementary list of American Journals and Societies to complete their catalogue of scientific memoirs. 2. That they recommend to the Society to offer to prepare, at the expense of the Royal Society, a catalogue of papers contained in such volumes of said list as the Royal Society may indicate.

Dr. Cresson exhibited his improved magnifying and polarizing oxyhydrogen apparatus. On motion of Dr. Bache, the thanks of the Society were presented to Dr. Cresson for the

pleasure and instruction he had given to the members by this exhibition.

Mr. Lesley drew the attention of the members present to the beautiful recent microscopical investigations of Prof. Sorby into the metamorphic condition of rocks.

Mr. Chase referred to the communication which he had made at the last stated meeting, and made further remarks respecting the alleged connection between the variable rate of the earth's rotation and the mean temperature of given parts of its surface.

Mr. Colburn's inquiry into the nature of heat suggests some interesting speculations concerning other effects of rotation than those that can be measured by the barometer. Recognizing the impossibility that the sun should warm the whole solar system, as a simply incandescent body,—the improbability that its heat should result from continuous combustion, and the probable approximate uniformity of temperature in the upper regions of the atmosphere, in summer and in winter, by day and by night, Mr. Colburn looks for the principal sources of heat in the earth itself. He supposes, 1, that the solar attraction tends to draw into closer proximity the particles of air on the heated side, and to separate them on the night-side of the earth, thus producing heat of compression, and cold of expansion: 2, that the change of eastward velocity from 69,000 miles per hour at midnight, to 67,000 miles at noon, (*sic*) necessarily produces a conversion of motion into heat, and of heat into motion: and 3, that if the earth is moving in a resisting medium, by which it is so retarded that it approaches the sun at the rate of 1,000,000 miles in 3,000,000 years, its "lift" involves the annual abstraction of a heat-force equivalent to 752,665,108,390,000 horse-power!

The third hypothesis has been often broached; the indications of a resisting ether, which, as we have seen, are furnished by the hourly barometric means, may, perhaps, yield the data for its final verification or rejection. The supposed separating effect of the sun's action in the most remote portions of the atmosphere, is so problematical that it seems hardly deserving of any consideration, and even if it existed, it is difficult to understand how it could produce a difference of more than a fraction of a degree in the range of the thermometer. The alternate acceleration and retardation of orbital velocity, can produce no *accumulation* of heat to supply any

loss that may arise from radiation into space, but it must modify the *distribution* of heat throughout the day in a manner that may be readily calculated. The available data are not sufficient to furnish us with complete results, but they give curious approximations that seem to open a wide field for profitable investigation.

"Sir John Herschell finds the direct heating effect of a vertical sun at the sea level to be competent to melt .00754 of an inch of ice per minute, while according to M. Pouillet, the quantity is .00703 of an inch."* Taking the mean of these two estimates (.00728 in.), multiplying by the latent heat of water (142.6° F.), and dividing by the number of cubic inches in 1 lb. of water (28), we obtain $\frac{.00728 \times 142.6}{28} = .037076$ units of heat received per minute on each square inch of the earth's surface that is exposed to a vertical sun. The weight of the aerial column being 15 lb., and its ratio of specific heat 25, the maximum effect of the direct solar rays is sufficient to heat the whole atmosphere $\frac{.0371}{15 \times .25}$ per minute, or 7.12° F. in 12 hours.

Now, in consequence of the earth's rotation, the difference of atmospheric "lift" between noon and midnight, is 182,336 ft. per minute. The average difference for the twelve hours, is one-half as great. "Rapid rotation, without friction or resistance, cannot in itself alone be regarded as a cause of light and heat;"† but we have found in our barometric investigations, that the ratio of the half-daily velocity of rotation to that which would be conferred by twelve hours' action of terrestrial gravity, is .00109, which may be regarded as the modulus of heat-producing resistance. If we multiply the average difference of lift by the weight of the atmosphere, and by the effective resistance, dividing the product by the ratio of specific atmospheric heat, and the number of foot-pounds raised by a unit of heat, we obtain $\frac{91168 \times 15 \times .00109}{770 \times .25} = 7.74°$ F. as the amount of heat communicated to the air by rotation between midnight and noon, and abstracted between noon and midnight.

The theoretical barometric lift is, as we have seen, .00219 of the entire weight of the atmosphere. Estimating the height of the aerial column when reduced to uniform surface density, at 24,000

* Tyndal, Heat considered as a Mode of Motion. N. Y. edit. p. 431.
† Dr. J. R. Mayer.

feet, the heat-producing disturbance that is indicated by the barometer, is represented by a lift of 15 lb. on each square inch to a height of .00219 × 24000 ft. The quarter-daily disturbance from this cause is, therefore, $\frac{24000 \times 15 \times .00219}{770 \times .25} = 4.1°$ F.

It is more than likely that each of these results will require important modifications when the entire influence of the several conditions of the problem is better understood. I have thought it proper to present them in their present crudity, in order to show the true points of departure, and to prepare the way for some further considerations.

Whatever other heat-disturbing causes there may be, there can be little doubt that the three we have just been considering are the most important. Dividing the astronomical day into four quadrants, and representing the solar effect by S., rotation by R., and barometric by B., it will be readily seen that the several positive and negative influences must be distributed as follows:

	S.	R.	B.
From 0h. to 6h.	+	—	—
" 6h. to 12h.	—	—	+
" 12h. to 18h.	—	+	—
" 18h. to 0h.	+	+	+

The tables of average temperature at any given place would therefore furnish us with four equations for determining the value of each of the disturbing elements, provided those that are unknown were so insignificant as to be safely neglected. The effects of these unknown disturbances are confined within certain limits that can be pretty satisfactorily determined.

Our discussion of the barometric fluctuations demonstrated a tendency of inertia to retard the effects of rotation, so that the mean daily altitudes are found nearer to 1h., 7h., 13h., and 19h., than to 0h., 6h., 12h., and 18h. A like tendency is discernible in the thermometer.

There are three, and only three, quadrantal divisions of the day, commencing respectively at 0h., at 1h., and at 2h., for which we could obtain approximate positive values of S., R., and B. The maximum solar effect is deduced from the first, and the minimum from the third of these divisions; while the maximum rotative and barometric effects are exhibited in the third, and the minimum in the first division.

The nearest average temperatures are found in the third division, as is shown below.

Average of temperature at 2h., 8h., 14h., and 20h., and of the entire day.

Station.	Mean of the four hours.	Daily mean.
At Girard College, . .	52°.1	52°.1
At St. Helena, . . .	61°.65	61°.69

The following table presents all the co-ordinate positive values of S., R., and B., that can be obtained from the Girard College and St. Helena means.

Station.	Dividing at								
	0, 6, 12, 18h.			1, 7, 13, 19h.			2, 8, 14, 20h.		
	S.	R.	B.	S.	R.	B.	S.	R.	B.
Girard College, . .	Per ct. 45.92	Per ct. 41.32	Per ct. 12.76	Per ct. 31.3	Per ct. 49.5	Per ct. 19.2	Per ct. 13.8	Per ct. 63.2	Per ct. 23
St. Helena, ...	25.97	42.96	31.07	15.8	46.7	37.5	5.6	56.6	37.8

The percentages of the calculated values correspond very nearly with the means of the earliest Girard College and St. Helena values.

	Calculated values.	Percentage.	Mean Percentage.	Limits.	
S., . . .	7°.12	37.6	35.95	5.6	45.92
R., . . .	7°.74	40.8	42.14	40.8	63.2
B., . . .	4°.1	21.6	21.91	12.76	37.8

It may be inferred from this comparison, that the rotation element of daily heat is least affected, and the solar element most affected by extraneous causes, (of which moisture is probably the chief); that the first division gives the best, and the third division the poorest results; that the proportion of thermometric variation which is attributable to rotation is between .4 and .5 of the average total daily variation, and that the most difficult element to determine satisfactorily is S., which is modified by many local disturbing influ-

ences, such as the nature of the soil, amount of vapor, clouds, altitude of the sun, &c. &c.

Pending nominations, Nos. 508 to 518, and new nomination No. 519, were read.

On motion of Mr. Peale the following resolution was considered and adopted: *Resolved*, That the Curators be authorized to make such selection as they may deem proper, of articles from the Cabinet of the Society, and place them at the disposal of the Chairman of the Committee on Curiosities, Relics, and Autographs, for the Sanitary Commission, as a loan for exhibition during the ensuing fair.

And the Society was adjourned.

Stated Meeting, March 18, 1864.

Present, twenty-three members.

Judge SHARSWOOD, Vice-President, in the Chair.

Prof. William D. Whitney, a recently elected member, was introduced to the presiding officer and took his seat.

Letters announcing the transmission of publications were received from the Royal Academy at Lisbon, dated November 25th, 1863, and from the Engineer Department at Washington, March 17th, 1864.

Donations for the Library were announced from the Royal Academy at Lisbon, the Royal Society at Edinburgh, the British Meteorological Society, the Annales des Mines, the Boston N. H. Society, the Franklin Institute, Messrs. Blanchard and Lea, and the Engineer Department of the United States.

On motion of Mr. Barnes, Dr. Goodwin was appointed to prepare an obituary notice of the late President Hitchcock.

The Secretary read a letter from Prof. Wilson, of Toronto, offering for sale a new copy of the "Birds of Australia," costing originally £150, and never yet taken from its case.

Mr. Lesley presented for the Cabinet, a specimen ball of sea-grass, and described the manner in which multitudes of similar balls, of all sizes, are manufactured by the waves, upon the shores of Nice.

Mr. Lesley then read a communication, which he had received from Mr. R. Pearsall Smith, of Philadelphia, in reply to inquiries, which he had made, respecting the published county maps of the United States.

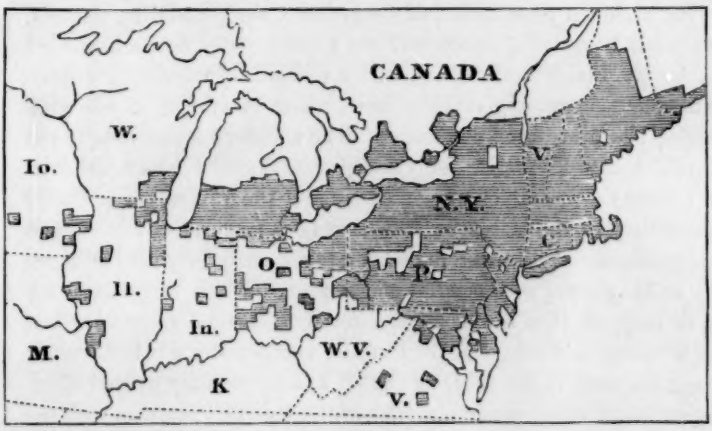
His own attention had been called to the subject anew, and very forcibly, by the difficulties he had lately encountered in obtaining a map of Cumberland County, at the county seat, Carlisle. At the last invasion of the State, preceding the battle of Gettysburg, the advance guard of the rebels swept the Great Valley clean of all its county maps; those of Franklin and those of Cumberland. The same fate befell those of Adams County. For a day or two, not a map of the seat of war was to be obtained at Harrisburg for the use of the Governor and his staff. General Couch had but a single copy at his headquarters. An order on Philadelphia could only be filled by sending out a special agent, who succeeded, at great personal risk, in procuring one or two of each county. Judge Watts, of Carlisle, informed me that the maps were torn hastily from the walls of the farmers' houses, and sent with the horses and other valuables for safety, over the North Mountain, into the Juniata Valley. The rebel visitation was very complete; he thought it likely that not a single house had been overlooked. The sack of the Valley would have been most disastrous, but for the want of rolling stock on the railroad. What they carried off was on their backs. The two engines and trains which took the Pennsylvania troops up to the front at Chambersburg, were telegraphed back so exactly at the right time, that they had passed Scotland Station but four minutes before the Rebel cavalry dashed in from the south to cut them off.

A rebel general is understood to have made a reconnoissance of these counties previous to the invasion under the guise of a map-peddler, and while selling some of a more general character, no doubt bought up county maps to be used in the invasion.

It is known that the bureau at Washington was robbed of many unique county maps before the rebellion broke out. When General McClellan advanced upon Richmond, but one copy of the map of Henrico County could be procured. The rebel leaders had secured,

also, all but one or two copies of Loudon and Jefferson and the few other Virginia counties of which maps had been executed. General Crawford informed me that on his advance to Culpeper, he was fortunate in securing two beautiful manuscript maps of that county; but for the long campaigns in Virginia, the utmost annoyance has been experienced for the want of maps. The mountain country of Virginia has never been mapped, with even the most distant approximation to topographical truth. The mountains of East Tennessee do not form so complicated a system as those of Western Virginia, but no map of their features worthy of the name is in existence yet. Even the large sheets of the seats of war issued for pressing and popular need from the United States Coast Survey Office, can scarcely effect a reduction of the principal errors. Nor can that mountain belt be mapped except by topographical geologists, on the plan pursued by the geologists of the Pennsylvania survey. It is to be hoped that on the return of peace, this greatly desired contribution to science, the extension of the Pennsylvania Appalachian Topography southward, will be made, and with an advantage not enjoyed by those who did the work in Pennsylvania, namely, with well-constructed county maps, done with an odometer, like those of the Northern States.

The number of these Northern county maps is now very great. Mr. Smith has kindly colored for me a map of the United States, to



show the parts covered by these odometer surveys. They are 300 in number. They have formed the basis of the recently published and very correct State maps of New York, Pennsylvania, and New Jersey.

But as the editions of the county maps are always small, seldom exceeding 1000 copies, and after one or two dozen extra copies have been struck off for the publisher, the stones are always destroyed, they go out of the market, and become extremely difficult to procure. In important cases special agents have to be despatched to the locality to purchase copies from the walls of the farmers' houses, at a high price.

It would be natural to expect to find complete sets of the county maps of each State in the archives of its capitol. Strange to say, none such is known to exist except at Albany. Stranger still, no set of these maps, no record of all this labor done, is to be seen at the Capitol of the Nation, neither in the Library of Congress, nor in the Bureau of the Interior, nor at the Bureau of the Coast Survey. A few of them, the number amounting perhaps to one-twentieth of the whole, are on file in the Engineer Department of the United States. And yet every day diminishes the chance of making up such a set. Within the last two months the editions of thirty have been exhausted.

In striking contrast to our own conduct, the British Government has possessed itself of a complete set of American county maps, by giving a standing order for each, as it appears, to be sent to the British Museum. Recent orders to send "everything in the map way relating to the United States," took the last copies of the twenty rarest of these county maps.

For eighteen years, this slow discussion of the boundaries, streams, roads and houses of the surface of the United States, has been carried on by Mr. Smith* and others, with a continually improving organization, and increasing rapidity, until about two-thirds of the well-settled North has been delineated. The fieldwork seems rude to the physicist, engaged in discussing the figure of the earth, and to the chief of a survey of an arc of a meridian. But the results are perfectly satisfactory to the naturalist, the county surveyor, the soldier, and the geologist. The latter finds his canvas ready prepared, and can lay in his picture with comfort and success. When larger areas are to be mapped, then astronomical determinations and trigonometrical adjustments come in place. But the compensations which rectify magnetic work in the field, by skilled hands, carefully plotted afterwards in the office, produce results which favorably compare with the most careful triangulation; and at all events may, if the needs of society call for it, precede, in order of time, just as well as follow, the application of the more accurate methods of the science.

* R. Pearsall Smith, 517 Minor Street, Philadelphia.

Mr. Fraley spoke to the same subject, describing the early history of the efforts made by citizens of Pennsylvania to obtain an improved State map, and the desirableness of an accurate astronomical and trigonometrical determination of the principal points of the surface. He suggested the expediency of the Secretary preparing, for the next meeting of the Society, the draft of a memorial, which may be presented to the Legislature, during its present session.

Pending nominations Nos. 508 to 519, and new nominations Nos. 520, 521, were read.

The Chairman of the Board of Curators presented the following report, as ordered at the last meeting.

HALL OF THE SOCIETY.

At the last stated meeting, a letter from Dr. Leidy was read, containing a copy of a resolution unanimously passed by the Academy of Natural Sciences, at the meeting of the 23d ultimo, in the following words:

"With the view of facilitating the study of archæology, *Resolved*, That the specimens of antique art, belonging to the Academy, be deposited in the Museum of the American Philosophical Society, provided they shall be returned, on demand, and that the Curators of the Society shall give a receipt for the same to the Curators of the Academy."

The Curators of the Society have given due consideration to the resolution quoted, and are of opinion that it is highly expedient that the deposit should be accepted, and the specimens of the Academy be added to the collection of the Society, already embracing a considerable number and variety of articles of the "stone age" of this country, and a magnificent collection of those of Mexico and Peru, &c.

The Curators are impressed with the conviction that it is incumbent upon the Society to lend their fostering countenance to this department of science, particularly as there is no institution in the city or State which has paid any attention to the subject, or afforded any facilities for its study or development.

With these views, the Curators beg leave to offer the following resolutions:

1. That they be authorized to receive the deposit of the Academy, and to give the required receipt for the same.

2. That they be authorized to exchange such duplicate specimens

of the collection of the Society as they may deem advantageous in extending and increasing the variety and completeness of the Archæological Cabinet.

On motion, the report was accepted, and the resolutions annexed were adopted.

Mr. Peale then begged leave to make the following additional remarks, with the sanction of his colleagues, upon the subject submitted to the Curators:

The Curators having charge of the Museum and Cabinet of the Society, are aware of its condition, and of the wants of the Society for room, particularly for the Library. They have, therefore, carefully taken the matter into consideration, and offer, respectfully and deferentially, a few remarks as an apology and explanation for the resolution which is appended.

Many books are now, of necessity, placed in the Museum, the cases, however, being entirely unsuited to their proper accommodation. These cases being sparsely occupied by the collections of minerals and fossils, shells, fossils, and minerals are also stowed and packed in various closets, under cases, in their present condition inaccessible to observer or student, and, therefore, in no condition to aid the "*promotion of knowledge.*"

Bottles containing specimens in spirits are drying up, or have entirely evaporated, and a case of insects contains only the reliquiæ of the contents, and has almost literally turned to the original dust from which they were created.

With these facts before them, the members of the Society will be able to appreciate the objects in view, and to vote understandingly on the resolution offered.

Resolved, That so many of the specimens of the collection of minerals and fossils belonging to the Society, as the Curators may select, be deposited in the Cabinet of the Academy of Natural Sciences, provided, that they shall be returned, on demand, and that the Curators of the Academy shall give a receipt for the same to the Curators of the Society.

Mr. Fraley made honorable mention of the part which the science and zeal of the lamented Prof. Keating had played, in the original collecting of that Cabinet, which was after-

wards made the property of the Society by the liberality of Mr. Poinsett.

The resolution of Mr. Peale was then adopted.

And the Society was adjourned.

Stated Meeting, April 1, 1864.

Present, nineteen members.

Dr. Wood, President, in the Chair.

A letter of acknowledgment was received from the Liverpool Literary and Philosophical Society, dated February 29, 1864.

Letters of envoi were received from M. the Minister of Public Instruction, dated Paris, November 21st, M. Hector Bossange, dated Paris, February 25, and the Liverpool Literary and Philosophical Society, dated March 17, 1864.

Donations for the Library were announced from M. Troyon of Lausanne, the London Reader, the Literary and Philosophical Societies of Liverpool and of Quebec, Silliman's Journal, the Academy of Natural Sciences, Professor J. C. Cresson, and Dr. Kirkbride of Philadelphia.

The death of Dr. Franklin Bache, at his residence in Spruce Street, on Saturday evening, the 19th ultimo, aged 71 years, was announced by Mr. Fraley, with a feeling tribute to his venerated character and long and varied relations to the Society. On motion of Mr. Fraley, the President, Dr. Wood, was requested to prepare an obituary notice, to be read before the Society.

Mr. Chase continued his remarks upon heat and afterwards illustrated the polarizing action of muscular energy by a magnetic needle held in the hand, but explained the phenomenon as due chiefly, if not solely, to a law governing the mechanical propagation of vibrations.

On account of the mutual dependence of all the forces of nature, and the reasonableness of Prof. Faraday's conjecture, that they are often, if not always, convertible more or less into each other,* it seems probable that the disturbances of the magnetic needle may be as closely connected with the earth's rotation, and the continually changing position of each point relatively to the sun, as those of the barometer and thermometer. Ampère held that the earth is an electro-magnet, magnetized by an electric current from east to west, the current being excited by the action of the sun's heat successively on different parts of the earth's surface as it revolves toward the east. The friction of trade-winds and ocean-currents and the variations of light and temperature that are produced by rotation and orbital revolution, must exert an influence upon the magnetic needle, and beside these indirect effects, M. Arago showed that simple rotation, in some unknown way, produces magnetism in bodies of every description. Many have supposed that this magnetism is derived from the earth by induction, but on account of the impossibility of escaping from the influence of terrestrial magnetism, it is difficult to obtain any conclusive evidence on the subject.† A similar impossibility has interfered with Prof. Faraday's endeavors to connect gravity and magnetic or electric action by experimental results. The probability of such a connection has been shown by the electricity developed in the dry pile of De Luc, and by Gen. Sabine's observation, that when the sun and moon were on the meridian the magnetic variation reached 5°, but when they were in quadrature, it fell as low as 20′.‡

The great forces of nature can be measured only by their disturbances or their deviations from uniformity. The action of gravity is so nearly uniform at all times and in all parts of the globe, that it is difficult to imagine any crucial experiment that could demonstrate its relations to magnetism. Perhaps a needle, hinged at its point of support, with the two extremities nicely balanced, might help us towards such a demonstration, if careful experiments were tried, to show the relative influence of gravity upon each extremity, both before and after magnetizing, and when subjected to artificial magnetism, so as to produce various amounts of deviation from the normal dip and declination. Or, centrifugal force, so applied as alternately to assist and oppose the effects of gravity, as in large fly-wheels revolving with various degrees of rapidity, may indicate variations of

* Phil. Mag. 4th Ser. 1, 68.

† See correspondence of M. J. Nickles, Silliman's Journal, v. 17, p. 117, &c.

‡ Silliman's Journal, vol. 19, p. 424.

magnetic influence, that can be explained only by the conversion of gravity into magnetism or the reverse.

Prof. Faraday, in a lecture before the Royal Institution in the year 1857, endeavored to show that our usual conception of gravity is not in harmony with the principle of "conservation of force." Prof. Brücke* and others, have tried to remove the difficulties in which the question is involved, but I believe none of the proposed solutions have been satisfactory to the learned philosopher who first started the discussion.

It has even been questioned whether gravity can be properly called a force, or whether it is anything more than a simple "tendency." Prof. Brücke has shown conclusively, that it is subject, like heat and other recognized forces, to all the laws which regulate the interchange of *actual* and *potential* energy; and our barometrical investigations furnish a beautiful illustration of the manner in which its tension is balanced by opposing forces.

We speak, indeed, of weight, as if it could be predicated only of bodies at rest, and as if it were so entirely distinct from momentum that no comparison could be properly instituted between the two. Precisely the reverse is true. Absolute rest is apparently an impossible condition of matter, for, to whatever extent the action of opposing forces may be relatively neutralized, the inconceivable rapidity of æthereal, planetary, and stellar motions, produces a constant change of place. Even if we confine our attention to the earth alone, in each instant (dt), every particle has a tangential motion (tan. $d\theta$), and a central motion of gravity (sin. $d^2\theta$) that constitutes a *vis viva* which we call its weight, and which is in equilibrium with the elasticity of the molecular æther. The sum of all the instantaneous energies is the same, whether the particle fall freely for any given time, or remain apparently at rest. All the potential energy which is transformed in one case into the actual energy of motion,† in the

* Phil. Mag., 4 S., 15, 81.

† The potential energy of gravity is represented by $g = 32$ ft. per second. The earth's rotation allowing only about $\frac{1}{290}$ of this amount, or .1107 ft. per second, to be converted into actual energy, the remainder must be employed in overcoming molecular elasticity. The formula $a = \left(\frac{gt^2r^2}{4\pi^2}\right)^{\frac{1}{3}}$ gives 26,221 miles as the radius of the sphere of attraction that is in equilibrium with the molecular elasticity at the earth's surface. These opposing forces must produce constant oscillations, and by the study of these oscillations, it may perhaps be possible to reconcile the several hypotheses of Newton, Faraday, Mossotti, and Challis, respecting the nature of gravitation. See Phil. Mag., 4 S., v. 13, p. 231-7, and v. 18, p. 447, sqq.

other is counteracted by an equivalent and opposite central energy of elasticity. Therefore, when we compare the relative effects of rotation and gravity, it is immaterial whether we use as the measure of force, the integral of the *vires vivae*, or the respective amounts of motion that the two forces would produce, if they were able to act freely for the same time. The difficulty of determining the repulsion of molecular elasticity precluding any satisfactory use of the former measure, I employed the other, and the precise accordance of the results thus obtained, with the results of observation, justified the correctness of the hypothesis, in the same manner as the accurate computation of planetary motions has confirmed the Newtonian theory of gravity.

Gravity, therefore, with the same propriety as heat, may be considered as a "mode of motion," whether acting merely as "dead weight," or as an accelerating or a deflecting force. If it can be shown that magnetism also originates in motion, we may be able to demonstrate the mutual convertibility that Faraday suspected.

The earliest hypothesis with regard to terrestrial magnetism looked for its cause to a powerful magnet, lying nearly in the line of the earth's axis. Subsequent discoveries led to a modification of this view by the supposition of another magnet, pointing towards the Siberian pole. Mr. Barlow's idea, that the magnetism is superficial and induced,* has now been generally adopted, and if it could be shown that solar or rotary action is capable of developing magnetism in particles such as those which are known to constitute our globe, the great difficulty in the way of a satisfactory explanation would be removed.† Ampère's, Barlow's, and Christie's experiments showed that simple rotation is sufficient to affect the magnetism of a compass-needle,‡ and in the oxygen of the atmosphere, which, as Faraday discovered, has a specific magnetism, variously estimated at from $\frac{1}{852}$§ to $\frac{1}{2857}$‖ of that of iron, we have a medium through which any induced magnetism may be distributed over the entire surface of the earth. Some simple experiments that can be easily repeated, seem to confirm Ampère's views, and to indicate the manner in which the circulating electric current is excited.

* Phil. Trans., 1831.

† Enc. Brit., Art. "Magnetism."

‡ The effect of rotation on the magnetic needle may be shown in a rough way, by causing an ordinary grindstone to revolve rapidly, and bringing a compass near its edge.

§ By M. Becquerel. ‖ M. Plücker.

There is a species of mechanical polarity, of which I have never seen any notice, that is apparently produced by motions resembling those to which the air is continually subjected. It may be exhibited in the following ways:

1. In the middle of a basin of water, lay a long strip of any substance (floating it by corks or otherwise, if it is heavier than water). After the water has become still, lift the basin carefully by one hand, and hold it at arm's length. The intermitting muscular action produces longitudinal vibrations, which tend to bring the floating strip into a line with the outstretched arm, and the tendency may be increased by moving the basin gently up and down.

2. Hold the gimbals of a binnacle compass so that it can swing only in one direction, and cause it to move like a pendulum in that direction. The needle will tend towards the line of oscillation. Vessels may have been lost from ignorance of this fact, for it is not unusual for compass pivots to become so worn that the needle moves sluggishly, and in order to start it, the compass-box is shaken. If one of the gimbal hinges should be rusty, the shaking would bring the needle into a line perpendicular to the axis of the free gimbal, and the captain might easily suppose that he was sailing north, when his course was due east or west.

3. Take an ordinary pocket compass, grasp it firmly between the thumb and finger of one hand, and move it quickly up and down through a small arc. The needle, as in the last instance, will tend towards the plane of motion. This experiment may be variously modified, according to the length and directive energy of the needle, the steadiness of the operator's nerves, &c. Sometimes a simple grasp, with a powerful muscular contraction, will bring the needle into line, without any other vibration than that which arises from the irresistible nervous tremor. Sometimes the momentum acquired by each pole in its approach to the operator, carries it forward so as to bring the other pole under the wave-influence, and the needle is thus made to rotate so rapidly as to become nearly invisible.

The polarity in each of the three cases here enumerated, is easily explained upon purely mechanical principles, but there are some indications that seem to show a close connection between the mechanical vibrations and those of nervous electricity. There appears to be a great difference in the control of different individuals over the needle. Some can bring it into line at once, with scarcely any perceptible motion, while others are obliged to use considerable effort; the needle does not seem at all times equally susceptible; it often

appears more easy to produce rotation in one direction, than in the other. There may, therefore, be a natural connection between these experiments and those of M. Du Bois Raymond, who attached two strips of platinum to a very delicate galvanometer, and caused them to dip into two cups of salt water. Dipping the fingers of each hand into the cups, and alternately bracing the muscles of each arm, he produced a perceptible deflection of the needle. MM. Becquerel and Despretz repeated the experiment without obtaining very satisfactory results, but M. Humboldt was more successful.* Add to these phenomena the well-known evidences of a constant current, circulating around magnets, and if we suppose that electricity consists simply of vibrations, it will seem perfectly natural that the magnet should obey the strongest vibrations.

Mr. Briggs exhibited a suite of specimens, to illustrate the steps of the new process by which non-resinous woods are converted into paper pulp, by the application of soda at high temperatures.

Dr. Emerson embraced the opportunity to describe the successful performance of the new machines, now employed in cleaning out flax fibre for market, with little or no loss in the form of tow, the flax, thus obtained, commanding a market value three or four fold that of the seed; so that it has been stated that a profit of $400 per acre of flax-sown ground has been realized. The machine has three sizes and forms, and may be called the cotton gin of the North. Mr. Briggs explained how much of the superiority of the Irish linen depended on the perfection of the rotting process carried forward under the regular humid climate of Ireland, and considered it improbable that any successful competition could be made in America, until some artificial chemical process shall be discovered applicable to the case, like the hot soda process, which he had described in connection with wood fibre, and by which fine cotton-like flax had also been produced, a specimen of which he exhibited.

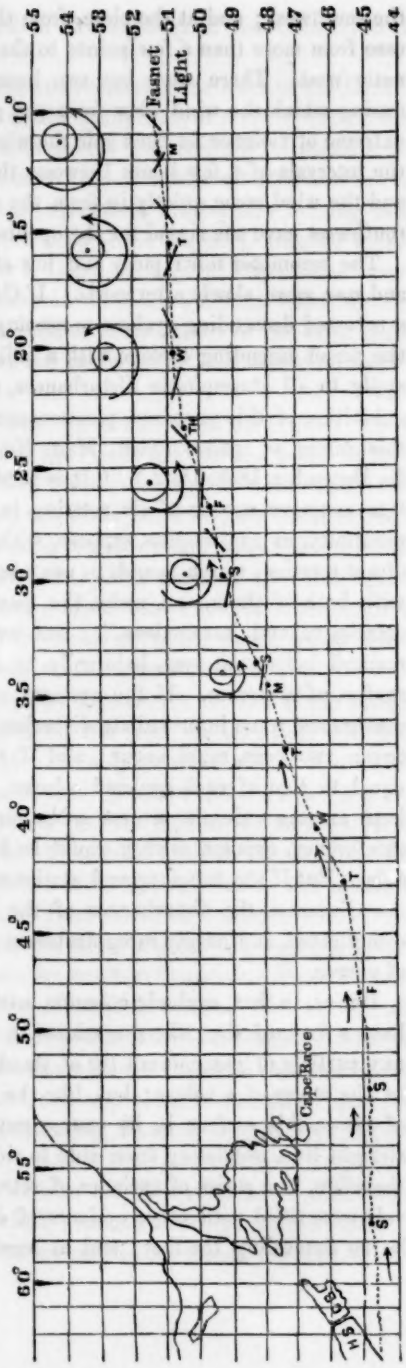
Mr. Lesley described the succession of gales encountered by the B. M. S. S. Canada, on her hundredth and longest voyage, from Liverpool to Boston, between the 11th and 21st of January, 1864.

* See Silliman's Journal, vol. 8.

The steamer left Liverpool, with fair weather, on the 9th, and encountered a smart blow in the Irish Channel, but ran along the Irish coast in fair weather, touched at Queenstown for the mails, and passed Fasnet Rock Light in the night of Sunday, January 10th. It began to blow from the westward here, and continued to blow from that quarter, dead ahead, with variable violence, until Thursday night, January 21st. The steamer reached Halifax, in the face of light west winds, Monday evening, January 25th, and Boston, Wednesday afternoon, January 27th, after a voyage of *nineteen* days.

The accompanying woodcut shows the course of the steamer and her position each noon between Fasnet Light and Halifax. In the first eight days, that is to say, from Sunday noon to the second following Monday noon, the Canada encountered six distinct gales, the sixth and last raging through Sunday night with such violence that the steamer could barely be kept to the wind; and the officers asserted that no sailing vessel could have lived.

At the beginning of each gale, the wind came from



the southwest; and at the close, from the northwest; but in neither case from more than a few points to the north or south of the magnetic west. There were but two hours during the whole voyage during which the wind blew from any point east of south. At the extreme of violence for each gale the wind blew dead ahead. During the intervals of a few hours between the gales, the sky would clear, and the wind come quietly in from the west, until its shifting to the southwest gave the signal for the opening of the next blow.

The barometer fell rapidly and low at the beginning of each gale, and rose more slowly afterwards. If Captain Galton's hypothesis of a reversed descending cyclone to accompany a rising barometer after the direct ascending cyclone with a falling barometer, be intended to apply to all atmospheric disturbances, small as well as large, some exhibition of this supposed phenomenon should have been made by this series of gales. (Phil. Mag. No. 174, p. 225, Proceed. R. S., December 18th, 1862.) "It is hardly possible," he justly urges, "to conceive masses of air rotating in a retrograde sense in close proximity, as cyclonogists suppose, without an intermediate area of direct rotation, which would, to use a mechanical simile, be in gear with both of them, and make the movements of the entire system correlative and harmonious." But we have this very conception realized before our eyes, habitually, in every series of eddies on the surface of a stream. If the cyclonal columns were stationary and contiguous, some intermediate disturbance, analogous to a pinion between two cogs, must occur; and if the interval have a diameter equal to that of each cyclonal column, the disturbance might perhaps assume a simple reverse columnar form and motion at its circumference, opposed as they would be by the vertical stability of its axis. But if the two supposed stationary vorticals were nearer than one diameter, the disturbances of the interval must become very complicated, and hardly recognizable on a chart by any simple system of curves.

But as, in fact, cyclonic columns, such as those under discussion, have a forward slip, like the eddies in water, the line of motion of any particle of one column (or of its observed base) is by no means in the curve of a volute; but, like the path described by a particle of the earth's surface in its course round the sun, approximates a straight line, oscillating from side to side without an epicycle. If, therefore, in a series of cyclones of retrograde projection, the intervals were filled with other cyclones of direct projection, there could be no concealing the fact; and at least traces of such an interval

system would have appeared in the log-book of the Canada, in the voyage under discussion.

Such a waved line crossing and recrossing the wake of the Canada, twelve times in eight days, would graphically represent the forward movement of the winds encountered. Theoretically, it would represent one of two things: either, 1st, a horizontal libration of the fronts of successive masses of condensed atmosphere moving magnetic east, or north of east; a supposition which I imagine no meteorologist would accept for a moment; or, 2d, a system of curves belonging to the southern sides of six small cyclones, following each other along a line not quite parallel to the course of the ship, and to the north of it, close to it at the western end, and diverging from it eastward.

I say *small* cyclones, because when we landed at Halifax the inhabitants spoke with delight of the lovely weather the people of Nova Scotia and Newfoundland had been enjoying for more than a fortnight. A glance at the map will show, therefore, the small radius to be ascribed to the gales through which we had been fighting slowly our way. We must consider it therefore probable that these gales, however vortical in build, belong to a different system of disturbances from the periodical storms of immense radial sweep which travel along the Atlantic coast inland in the same direction.

The next important point to be observed, is the fact of the sudden commencement of the system on the west, at longitude 45° west from Greenwich, that is, where the ship's course ran out of the Gulf Stream and approached the Banks. That we did not cut across the axis of the system, is plain, from the fact that no *southeast* or *northeast* winds were encountered. Otherwise it would be easy to consider this system of gales as attached by some law to the northern margin of the Gulf Stream, at least as to their common axis of forward movement. But unless the series of gales had exhausted itself precisely at the moment when we reached longitude 45°, or actually commenced at that longitude, it must be allowed that the Canada then and there sailed *under* the system; which, in that case, must be regarded as descending from some region to the southwest, and in the upper strata of the atmosphere, and impinging at that point upon the surface of the sea, thence, continuing forward, at that level, to the coast of Ireland.

Whether this be the best view or not, it is remarkable that these violent disturbances are popularly confined to one particular season of the year. Captain Moody, on consulting the record log-book of the

steamer, found that the next longest voyage of the Canada had been its first. He stated that all the voyages from Liverpool to New York, commencing about the 9th of January, were longer and stormier than the others. In 1863 the corresponding voyage made by the Europa had been one of 21 days. That of the America in 1862 had also been one of 21 days. The succeeding voyage is always considered a good one, not as against a prevalent west wind, but as against gales.

The *average* time of endurance of each gale was 26 hours, and the average interval of comparative calm was 6 hours. If 60 miles an hour were given as the speed of the wind, and this were considered to mark the speed of the vortical column, we would be obliged to consider the distance between the centres of the gales as about 2000 miles, and there could have been but one gale traversing at any one time the distance between the Banks and Ireland. There would be sufficient room, therefore, for it to assume any magnitude, however great. But the fair weather on the British provincial coast, as has been already said, seems to prove the small diameter of all the gales, and we must view each one, therefore, as making its solitary journey, as a simple eddy, nearly along the northern margin of the Gulf Stream, and probably enlarging its area as it advanced; which would account for the extreme violence of the gales we encountered last as compared with those encountered in the first part of the voyage.

But of course, the rate of motion of the nucleus cannot be fairly represented by the rate of motion of *any* given circle on its limb, unless that particular circle be selected at just the proper distance from the centre, to be a mean between the dead wind at the extreme circumference and the excessively rapid rotation at the centre. In some one of these gales, it is probable, that the ship's course did cut such a circle of mean motion, and got (without, of course, knowing it) the exact rate of the vortical, in the actual rate of the blast over the deck. It is a great mistake to draw a vortical storm with the shape which it would have if it had no body-movement forward and moved in vacuo. The fact must be, that most of the sections of a cyclone move forward with its nucleus in nearly parallel lines; and that the storm as a whole, while theoretically vortical, is in practice linear. It practises its gyrations only near its centre.

The form of such a gale, moreover, must be merely a form, like the form of a wave, the vortical movement being impressed on successive portions of air, which, after being in turn set moving, are in turn allowed to stop, fall into the rear, and come to rest.

Mr. H. S. Eaton remarks, in his paper on the antagonism of the polar and equatorial currents (Art. xli, Proc. B. Met. Soc., June, 1863), that "from some years' study of cyclonic storms and their courses Europewards, he should say that the greater proportion of these circular storms traverse the Atlantic in zones, parallel somewhat to the dotted line on his map of the great storm of the 18th and 19th of May, 1863, their course, however, varying according as the sun is north or south of the equator, their course being more *northerly* as the sun approaches the tropic of Cancer, and more southerly as it recedes therefrom." The line he draws, is one almost parallel to the course of the Canada after leaving the coast of Ireland, or about S. 20° W. (true). The coincidence of this course with that of the axis of the Gulf Stream after leaving the Banks, is a marked feature. No one yet, to my knowledge, has thoroughly discussed the action of the mass of air warmed, and no doubt also propelled in that direction, by the moving surface of the Gulf Stream, upon the wall of colder air to the north of it, and the vault of cold air overhead; yet we have in their apposition and reaction a cause of great and regular disturbance. Even if the mass of cold air to the north must be regarded as moving in the same direction, the different rates of the two movements, and the perpetual struggle of the lower part of the northern mass to inflow, and of the warm mass to uprise, must produce complicated movements of great regularity, and in the main vortical in a retrograde sense.

Admiral Fitzroy considers that he has established the occurrence of cyclones of destructive violence but limited area, originating locally in the vicinity of the British Islands. Are we then to look for such a spontaneous origination of vortical disturbances at any point along the track of our cyclones between America and Great Britain, or are they confined in their origin to the vicinity of land?

The principal points of interest, are the rate of the cyclones by which their relative distances might be measured, and the question of their generation about the 45th degree of west longitude, or their descent at that meridian from the upper regions of the atmosphere over the Atlantic seaboard States.

Pending nominations Nos. 508 to 521, and new nomination No. 522 were read.

Resolutions recommended by the Publication Committee, for the purchase of old copies of exhausted editions of the Transactions, old series, for the printing of No. 1, and title-

page of Vol. 1, of the Proceedings, and for providing a cover for future numbers of the Proceedings, were adopted.

On motion, Mr. Price, Mr. Fraley, and Mr. Colwell, were appointed a committee to take into consideration and report at the next meeting upon the subject of providing a lot for the future building of the Society.

And the Society was then adjourned.

Stated Meeting, April 15, 1864.

Present, fifteen members.

Dr. Wood, President, in the Chair.

Letters acknowledging the receipt of publications were received from the Natural History Society of Nuremberg, November 14th, and the Royal Society at Upsal, September 15th, 1863.

Letters of invoice were received from the Imperial Society of Naturalists at Moscow, September 6–12; the Royal Society at Upsal, October 15th; the Royal Society at Berlin, November 30th; the Royal Society at Stockholm, November 18th; the Royal Society at Munich, November 20th, 1863.

Donations for the Library were announced from the Royal Academies and Societies at Stockholm, Upsal, Moscow, Berlin, and Munich; the Geological Society at Berlin, the Natural History Society at Nuremberg, and the Zoological Society at Frankfort on the Maine; the Bureau of Public Instruction at Paris; MM. Desnoyers and Boucher de Perthes, Prof. Hennessy, Blanchard & Lea, and the Rev. Mr. Barnes, of Philadelphia.

Donation for the Album, from Mr. Isaac Lea, of the portrait of Dr. George Jager.

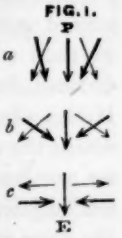
On motion, the Natural History Society of Nuremberg was placed on the list of correspondents to receive the Proceedings.

Mr. Chase made remarks upon the subject of magnetism, and in further illustration of what he had advanced at previous meetings.

Barlow's and Lecount's laws for the distribution of the induced magnetism in masses of iron, are precisely the same as would follow from the relative centrifugal motions of different portions of the earth, provided the magnetic axis coincided with the axis of rotation. It is therefore reasonable to presume that they accurately represent the superficial motions or currents on which the magnetism depends, and to hope that a careful study will enable us to detect the cause of the oscillations that polarize the air and all other bodies that are capable of vibrating in harmony with it.

If the earth were stationary, the sun's heat would produce a constant ascending current over the whole meridian, which would be supplied by colder lateral currents from each side. These currents are represented in Fig. 1. P, is the pole; E, the equator; *a*, *b*, *c*, the lateral currents. The light arrows represent the direction of the upper, overflowing, warm air, and the dark ones the direction of the lower, cool air. The effect of these several currents would be a mechanical atmospheric polarity, precisely analogous to that which was indicated by our experiments upon the control of the magnetic needle by mechanical vibrations.

FIG. 1.



In consequence of the earth's rotation, the tendency shown in Fig. 1, is communicated only at the instant of noon. At all other times, the flow of the cool air towards the equator, and of the warm air to the coldest portions of the globe, is modified by the earth's motion, so as to produce currents analogous to those represented in Fig. 2. P represents, in this instance, not the true pole, but the point of greatest cold. The warm air rises at E, and flows towards P until it becomes sufficiently cooled to sink to the earth. Still flowing onward it absorbs the heat of the earth, until it is so rarefied as to rise again. This process of alternate rise and fall, is continued until the air reaches P, and then returns by the same law and in a similar manner, to E.* These currents, which are flowing at all hours, and in

FIG. 2.

* Halley, in 1686 (Phil. Trans., No. 183), explained the trade wind, and the necessity of a reverse upper current, but he found it "very hard to conceive why the limits of the trade wind should be fixt about the 30th degree of latitude

all portions of the earth, produce an atmospherical directive energy towards the poles of maximum cold, which appear, according to Sir David Brewster, to coincide with the magnetic poles.

Now, if we consider that in addition to these permanent currents, there is a continual motion of silent convection, the warm air rising, and the cold air descending in parallel columns, like the particles in a vessel of boiling water,* and if we remember that the warm air is charged with moisture which is condensed as it ascends, parting thereby with much of its heat and electricity, we can hardly deem it necessary to adopt Dr. Dalton's hypothesis that ferruginous matter is the source of atmospheric magnetism. Still the existence of vaporized iron in the air undoubtedly contributes an increased intensity to the magnetic currents, and it may probably be an important agent in the production of magnetic storms.

The two vibratory systems represented in Figs. 1 and 2, are conjoined during the hours when the sun is above the horizon, and the laws of motion applicable to the first system correspond precisely, as we shall see hereafter, with the laws of the solar-diurnal variation deduced from General Sabine's admirable discussions of the St. Helena observations. It is not so easy to explain in its minute details the comparatively insignificant lunar-diurnal variation, but I am convinced that the aerial currents produced by lunar attraction, will sufficiently account for all the magnetic influence that is due to the moon exclusively. The changing barometric pressure, and the deposition of dew during the night, modify these currents in such a way as to disguise the simple effect of any slight disturbing cause; nevertheless, there is a manifest tendency underneath all the disguise, to maxima and minima at the precise hours when they ought to occur in consequence of the moon's attraction.

In the influence of the violet rays upon magnets, the connection of the violet rays with the tension of brass in the polariscope, the excitement of magnetic vibrations in iron by percussion and torsion, the increase of magnetism by cold and its diminution by heat, and the

all around the globe." I am not aware that any one has ever pointed out the combined effects of convection, absorption of heat from the earth, and the daily superposition of the currents represented in Figs. 1 and 2.

* It is very probable that this motion of convection is a more important agency than has generally been supposed. If we close the lower drafts of a common air-tight stove, and open a register immediately over the fire, the cold air does not rush directly to the draft pipe; but it falls with great velocity to the surface of the fuel, as may be shown by dropping pieces of paper through the register.

general correspondence between Challis's laws of molecular action and the laws of attraction and rotation, we may find interesting evidences of the unity of force which all modern discovery tends to demonstrate, and in that unity a sufficient explanation of the observed annual and secular variations of the magnetic needle, the disturbing magnetic effects of auroras and solar spots, the changes of the wind, and storms of every kind. Some of the well-known phenomena of storms furnish a ready test of the principles I have attempted to establish.

Although Fig. 2 represents the general tendency of a particle of air, it is not probable that all the atmosphere, or even, perhaps, any considerable portion of it, follows so regular a path. In the upper regions, where the air is not so much affected by the radiation of the earth, it may oscillate, as suggested by Redfield, "from centrifugal action towards the equator, and gravitation towards the poles,"* and between the points of decussation there are undoubtedly eddies which have a general movement eastward or westward, in accordance with the theory of M. Dové. These several currents are represented in Fig. 3. The disturbances of the æther, dependent upon the relative attractions of the earth and sun, probably produce tides corresponding in time with those of the barometer, which must modify the atmospheric currents. The character of these disturbances may be inferred from Fig. 4, the horizontal arrows representing the course of the æther under the solar influence, and the curved arrows its course under the combined attraction of the earth and sun.

FIG. 3.

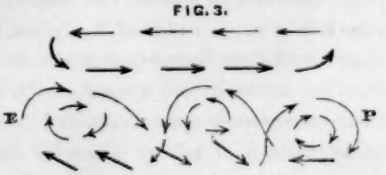


FIG. 4.

Having thus ascertained the causes and directions of the principal normal currents, the ordinary theory of winds enables us to understand the effect of mountain peaks, deserts, forests, rivers, and ocean-streams. Every point of the earth's surface that accumulates or radiates an undue amount of heat, becomes a centre of polarity with an attractive energy that disturbs the atmospheric equilibrium, tending to produce wind and rain. If the disturbance is confined to a

* Silliman's Journal, vol. 25, p. 130.

limited area, there is a well-known cyclonic tendency, the portion of the eddy which is nearest the equator, *generally* flowing eastward. Mr. Galton* has ingeniously shown that in descending cyclones, the direction may be reversed, and I should expect a similar reversal to be of frequent occurrence in the neighborhood of some of the powerful ocean-currents, at points where they tend to produce backward eddies. Such points are found midway between the Sandwich Islands and California, about 35° west of Chili, near the west coast of New Holland, in the Indian Ocean, northeast of Madagascar, and in other places.

The effect of ocean-currents in producing cyclones, and directing their course, is well illustrated by the repeated observations that have been made in the Gulf Stream. Prof. Lesley's interesting account of the series of storms encountered by the Canada on her one hundredth voyage,† exhibits the natural consequences of the friction of two belts of air at different temperatures, moving in opposite directions. The warm air over the Gulf Stream, and the cold air over the Arctic currents that flow nearer to the American continent, are both borne very nearly in their normal directions, but with the approach of winter their parallelism becomes almost vertical, the cold belt becomes wider from its encroachment upon the land, and the vortices that arise from their concurrence are frequently brought down to the surface of the ocean, instead of taking place in the higher regions of the air, as they usually do during summer.

While sudden, violent tempests that are occasioned by local disturbances over a limited area, are almost necessarily cyclonic, I am inclined to adopt Espy's theory with regard to long storms, that usually "the wind will blow in towards a line rather than towards a point," and in favor of this hypothesis as well as of the periodicity of weather-changes, I would suggest the following explanation.

The normal currents of the atmosphere (Figs. 2, 3) are subject, as we have seen, to a daily disturbance by the sun's action (Fig. 1). This disturbance, like the moon's tidal action, is cumulative, and has a constantly increasing tendency to overcome the aerial polarity. The gathering wave follows the sun until it is saturated with vapor, and as soon as it becomes powerful enough to influence the normal current, it must produce a shifting of the wind, and a deposition of moisture. The equilibrium of temperature is then restored, to be subjected anew to the same constant disturbance and the same stormy culmination.

* Phil. Mag., Sept., 1863.

† Proc. Amer. Philos. Soc., April 1, 1864.

[My attention has just been called by the last number of the Journal of the Franklin Institute, to some extracts from the London Athenæum for January, announcing a paper on Magnetic Storms, which was read by Mr. Airy before the Royal Society. I take this early opportunity to acknowledge that the Astronomer Royal appears, in some measure, to have anticipated the views upon the sources of terrestrial magnetism, which I have recently had the honor of communicating to the Philosophical Society.

As I have not yet seen the paper in question, I do not know how far the priority may extend; whatever may be its limits, it gives me pleasure to yield my claims to so distinguished and cautious an investigator, and to find that my own independent conclusions have been so ably corroborated. And I believe I have good grounds for hoping, that in the specific solar action which I have pointed out, Mr. Airy will find the precise "occasional currents produced by some action or cessation of action of the sun," for which he is looking. May 14.]

Mr. Peale made a communication on stone implements.

Pending nominations, Nos. 508 to 522, and new nominations, No. 523, were read, and the Society proceeded to ballot for members.

Mr. Fraley, on behalf of the Committee on the purchase of a building lot, reported progress.

All other business having been transacted, the ballot-boxes were opened by the presiding officer, and the following persons were declared duly elected members of this Society.

Benjamin V. Marsh, of Philadelphia.
James T. Hodge, of Newburg, N. Y.
James Kirchhoff, of Heidelberg, Germany.
Francis J. Pictet, of Geneva, Switzerland.
Benjamin Studer, of Zurich, Switzerland.
Alphonse Count de Gasparin, of Paris.
Peter Tunner, of Leoben, in Styria.
M. Thury, of Geneva, Switzerland.
Rev. Dr. Tholuck, of Halle-an-der-Saale.
Carl Schinz, of Offenburg, Baden.
William Sellers, of Philadelphia.
Richard S. Smith, of Philadelphia.
Alexander Wilcocks, M.D., of Philadelphia.

And the Society was adjourned.

Stated Meeting, May 6, 1864.

Present, seventeen members.

Judge SHARSWOOD, Vice-President, in the Chair.

Letters accepting membership were received from William Sellers, dated Philadelphia, April 26; from Alexander Wilcocks, dated Philadelphia, May 2; from R. S. Smith, dated Girard College, May 4th; and from Benjamin V. Marsh, dated Philadelphia, May 4, 1864. Mr. Marsh, Mr. Sellers and Dr. Wilcocks were presented to the presiding officer and took their seats.

Letters respecting the exchange of publications were received from O. Böhtlingk, of the Royal Academy of St. Petersburg, and from Henry St. John Maule, of the Agricultural Society at Bath, dated December 31st, 1863.

On motion of the Librarian, the request of the latter was ordered to be granted.

A letter was read from Sig. Zantedeschi, dated Padova, March 28, 1864, respecting his previous communications, requesting the publication of his letter of January 6th, as follows:

Alla Celebre Societa' Filosofica Americana in Filadelfia.

Cotesta illustre Societa' Filosofica gentilmente m'invitava ad inviarle il mio ritratto fotografato, essendosi essa proposto di formare un Album dei Membri della medesima. Io non mandrero' di adempiere a questo suo desiderio, che e' un onore per me, entro il prossimo venturo Marzo, nel quale potro' far eseguire la fotografia di due tavole risguardanti i miei esperimenti e le mie ricerche sullo spettro luminoso. Di queste e di altre fu eseguita nel 1846 una edizione di pochissimi esemplari che non fu messa in commercio librario, e quindi ora irreperibile. In tali esperimenti trovansi parecchie verita' o scoperte che ora si attribuiscono ad altri fisici. Credo di non fare cosa discara alla Societa' rassegnandogliene del Capitolo III che tratta dell' analisi dello spettro solare una copia manoscritta, perche possa avere l'onore di essere pubblicata negli Atti della Societa'. Sara questa pubblicazione un' immagine scientifica che si riflettera' ovun-

que giungano gli Atti importantissimi di cotesto insigne Corpo Scientifico.

Anticipo frattanto le conclusioni, alle quali io giunsi colle mie investigazioni. Se queste furono cagione di un indebolimento della mia vista, che rimase intieramente spenta da arte matrigna per una soluzione concentratissima di *Atropa Belladonna*, possa almeno rimanere vivo e parlante un documento di quanto operai intorno allo spettro luminoso! L'indicazione delle pagine citate per cadauna conclusione si riferisce al mio manoscritto che sara' rassegnato, il quale e' di pagine 36. Seguano le mie conclusioni.

Dalla storia analitica degli spettri luminosi e dalle mie esperienze, che ho riferite, raccolgo aver determinato:

1°. Che lo spettro luminoso è un analizzatore chimico il piu' squisito che abbia la scienza fino al 1863, per iscoprire l'esistenza delle sostanze che ardono nelle fiamme e le loro variazioni (pag. 7, 12, 30, etc.)

2°. Che lo spettro luminoso è un fotoscopio che determina la quantitá e qualitá de' raggi luminosi, che vengono assorbiti dall' atmosfera, come lo comprovano gli spettri che ottenni a cielo sereno, vaporoso ed intieramente coperto con pioggia (pag. 15, 22, 25, 30).

3°. Che esistono righe fisse e righe mobili quali sono de 574 sottili di Fraunhofer frapposte alle principali, per cui non ho potuto mai avere in Venezia ed in Padova l'identico completo sistema di righe ottenute da Fraunhofer in Monaco (pag. 17).

4°. Che il foco chimico è distinto dal foco ottico, e l'uno e l'altro variabili nelle varie ore del giorno e dei mesi e nei varj stati dell' atmosfera (pag. 18–21).

5°. Che lo spettro ordinario e'circondato da due spettri secondarj policromici e da due spettri monocromici, che variano per forma e per dimensioni nelle varie stagioni dell' anno e nei differenti stati dell' atmosfera (pag. 18, 20, 22, 23).

6°. Che una camera oscura ad elementi fissi potrebbe farci scoprire nella successione degli anni quali siano le righe proprie ciascun astro e quali siano quelle che devonsi attribuire all' atmosfera terrestre (pag. 30).

7°. Che lo spettro luminoso potra' rivelarci i cambiamenti ai quali soggiaciono i sistemi planetarj e le loro atmosfere (pag. 30).

8°. Che il movimento e varia glossezza delle righe dimostrano i moti intestini de' gruppi molecolari e de' lori movimenti di traslazione; per cui lo spettro solare non solo è utile alla meteorologia, alla

fotografia, ma ancora alla conoscenza fisica de' sistemi stellari (pag. 30, 31).

9°. Che lo spettro di Newton è formato di due coppie di colori semplici cive' rosso e giallo, azzurro e violetto; gli altri tre aranciato, verde ed indaco, che sono gl' intermedj, sono composti di rosso e giallo, di giallo e azzurro, di azzurro e violetto, come emerge dalle mie sintesi ed analisi (pag. 16).

10°. Che oltre le linee fisse e mobili trasversali, esistono linee longitudinali, le quali pure variano in numero, grossezza e posizione nei varj stati dell' atmosfera e nei varj mesi dell' anno, e cangiando gli elementi dell' apparato, quali sono la grandezza dell' apertura del porta-luce, la distanza del prisma dal porta-luce, la distanza del piano di projezione dal prisma etc. (pag. 23, 24, 25, 27).

11°. Che nei fenomeni dello spettro luminoso interviene la natura del corpo raggiante, il mezzo attraverso il quale passano gli efflussi luminosi, e l'apparato stesso dell' esperienza (pag. 28, 29).

12°. Che i fenomeni dello spettro luminoso si derivano dal vario riflettersi, rifrangersi, disperdersi de' raggi luminosi (pag. 29).

Ho avuto la compiacenza che le mie esperienze furono coronate dalla scoperta di nuovi metalli e dai risultamenti ultimamente ottenuti in America e in Francia, come emerge da quelli di Rutherford, Porro, Babinet, Piazzi-Smyth, Mascart etc (Moniteur de la Photographie, pag. 141, 1er Decembre, 1863, No. 18, Paris; Comptes Rendus, tom, xxxv, pag. 413 e 479, an. 1852; Cosmos, vol. xxiii, pag. 604, an. 1863; Comptes Rendus, tom. lvii, pag. 789, an. 1863).

Non potesano essere piu' confortanti e piu' onorevoli per me le parole del Sigr. Dr. Phipson dotto inglese, il quale scrisse: "Les recherches ingenieuses de Mr. le Professeur Zantedeschi ont sans doute contribué beaucoup à amener cette belle partie de la science spectroscopique au point ou elle se trouve aujourd'hui." (Lettre de Mr. le Dr. Phipson à Mr. Ernest Lacour, sur l'histoire des decouvertes spectroscopiques; Moniteur de la Photographie, No. 18, 1er Décembre, 1861, pag. 143.)

Sono co' sensi di altissima stima e profondo rispetto.

PADOVA, il 6 di Gennajo, 1864.

Donations for the Library were received from the Bureau of Public Instruction and M. Delesse, at Paris; the Royal Astronomical, British Meteorological, Geological, and Royal Asiatic Societies; J. W. Dawson, of Montreal; the Essex In-

stitute; George Ticknor, of Boston; the New Bedford Library; Silliman's Journal; Blanchard & Lea and the House of Refuge, at Philadelphia; the Bureau of Agriculture and Smithsonian Institution, at Washington; and the Buffalo Society of Natural Sciences. On motion, the last-mentioned Society was ordered to be put upon the list of Corresponding Societies, to receive the Proceedings.

A copy of Proceedings, No. 70, just published, was laid upon the table.

A donation for the Cabinet was announced from Mr. Jos. H. Merriam, of Boston, consisting of eleven varieties of tokens and medals, and a collection of sixty-eight more, from Mr. Pliny E. Chase.

A photograph likeness of O. Böhtlingk was received for the Album.

The death of a member of the Society, Evan Pugh, President of the State Agricultural College near Bellefonte, was announced by Mr. Fraley.

The death of a member of the Society, General J. G. Totten, Chief of Topographical Engineers Department, U. S., at Washington, was announced by the Secretary. On motion of Mr. Fraley, Dr. Vethake was appointed to prepare an obituary notice of the deceased.

Mr. Chase presented for publication in the Transactions, a note to his own paper, on Linguistic Resemblances, by Mr. James E. Oliver, of Lynn, Mass., which, on motion, was referred to the same commmittee, Prof. Haldeman, Dr. Coates, Prof. Kendall.

The subject of reprinting the missing numbers of the first volume of Proceedings was then taken up, and on motion of Mr. Fraley, committed, with discretionary powers, to the Secretaries.

Pending nomination No. 522, and new nominations Nos. 523, 524, were read.

The Committee in relation to a site for a future Hall, reported, that in the present state of the currency, Mr. Harrison declined to name any price at which he will sell his lot on the south side of Penn Square, but has promised not to sell it to

any one without giving the Society the opportunity of purchasing. Signed, Eli K. Price, Chairman. On motion, the report was accepted and the committee continued, with orders to report again when needful.

The bill of Sherman & Son, for printing No. 70 of the Proceedings, &c., amounting to $187 75, was referred to the Treasurer.

And the Society was adjourned.

Stated Meeting, May 20, 1864.

Present, fourteen members.

Dr. Wood, President, in the Chair.

A letter accepting membership was received from James T. Hodge, dated Newburg, May 6th, 1864.

A letter accepting the appointment to prepare an obituary notice of General Totten was received from Prof. Vethake, dated Mantua, Philadelphia, May 19th, 1864.

Donations for the Library were received from the Essex Institute, Columbia College, Buffalo Young Men's Association, Franklin Institute, and Smithsonian Institution.

Dr. Le Conte offered for deposit in the Library a collection of Oriental works, selected from the library of his father, late Major Le Conte, which were accepted, and ordered to be suitably marked and kept together to be rendered on demand.

BOOKS DEPOSITED BY DR. LE CONTE. MAY 20, 1864.

Mosis Chorenensis Historiæ Armeniacæ, libri tres. Ed. Whistoni, filii. Lond. 1736. 4°.

Nineveh and Persepolis. W. S. W. Vaux. Lond. 1850. 8°.

Mellificium Historicum, complectens Historiam trium Monarchiarum; Chaldaicæ; Persicæ; Græcæ. Ch. Pezelio. Marpurgi, 1610. 4°.

Mohammedis filii Chavendschahi, vulgo Mirchondi, Historia Samanidarum Persice. Fr. Wilken. Gœttingæ, 1808. 4°.

Travels in Chaldea, in 1827. Cap. R. Mignan. Lond. 1829. 8°.

Berosi Sacerdotis Chaldaici. Ed. ult. Antverpiæ, 1552. 12°.

Jac. Perizonii Origines Babylonicæ et Egyptiacæ. Tomis II. C. A. Dukerus. Traj. ad Rhenum, 1736. 12°.

De Regio Persarum. B. Brissonii. Ex typ. Hier. Commelini, 1595. 12°.

A Geographical Memoir of the Persian Empire. J. M. Kinnear. Lond. 1813. 4°.

Elements of the Chaldee Language. W. Harris. New York, 1823. 8°. Pamp. 24 pp.

Narrative of a Journey to the Site of Babylon in 1811. Journey to Persepolis. C. J. Rich. Lond. 1839. 8°.

Dissertation on the Antiquities of Persepolis. W. Price. 4°. Pamp. 36 pp.

Observations on some Medals and Gems bearing Inscriptions in the Pahlavi Character. Sir W. Ouseley. Lond. 1801. 4°. Pamph. pp. 44.

Mémoire sur deux Inscriptions Cunéiformes Trouvées pres D'Hamadan. M. E. Burnouf. Paris, 1836. 4°. Pamph. pp. 193.

A Dissertation on the Newly Discovered Babylonian Inscriptions. Jos. Hager. Lond. 1801. 4°.

A Specimen of Persian Poetry; or, Odes of Hafiz. Translated by J. Richardson from Revizky's Specimen. Lond. 1802. 4°.

Travels in Georgia, Persia, Armenia, Ancient Babylonia, &c. Sir R. K. Porter. 2 vols. 4°. Lond. 1821.

Journeys through Persia, Armenia, and Asia Minor. J. Morier. Lond. 1812. 2 vols. 4°.

The History of Persia. Sir J. Malcolm. Lond. 1815. 2 vols. 4°.

Travels in Assyria, Media, and Persia. J. S. Buckingham. 2d Ed. 2 vols. Lond. 1830. 8°.

De Persidis Linguâ et Genio Commentationes. O. Frank. Norimb. 1809. 8°.

Tableau Général de l'Empire Othoman. M. De M. D'Ohsson. Paris, 1788. 7 vols. 8°.

The Persian Moonshee. Fr. Gladwin. Calcutta, 1801. 4°.

Journal of the British Embassy to Persia. W. Price. Lond. 1825. 2d Ed. Vol. I. Long quarto.

Tarich h. e. Series Regum Persicæ, ab Ardschir-Bakekan. W. Schikardo. Tubing. 1628. 4°.

Observations on the Ruins of Babylon, as described by C. J. Rich. Rev. T. Maurice. Lond. 1816. 8°.

Dissertations on the Rhetoric, Prosody and Rhyme of the Persians. F. R. Gladwin. Calcutta, 1801. 4°.

Tentamen Palæographiæ Assyrio-Persicæ. A. A. H. Lichtenstein. Helmst. 1803. 4°.

Historia Priorum Regum Persarum. M. Mirchond. Pers. et Lat. cum Notis. Viennæ, 1782. 4°.

Mémoires sur Diverses Antiquités de la Perse. A. J. Silvestre de Sacy. Paris, 1793. 4°.

Veteris Mediæ et Persiæ Monumenta. C. F. C. Hoeck. Gotting. 1818. 4°.

Arsacidarum Imperium sive Regum Parthorum Historia. J. Foy Vaillant. 2 vols. 4°. Paris, 1725.

Veterum Persarum et Parthorum et Medorum Religionis Historia. T. Hyde. Ed. secund. Oxon. 1760. 4°.

Travels in Various Countries of the East, more particularly Persia. Sir W. Ouseley. 3 vols. 4°. Lond. 1819.

The Oriental Collections of W. Ouseley. 2 vols. 4°. Lond. 1797, 1798.

Lexicon Persico-Latinum Etymologicum. J. A. Vullers. Vol. I. 1855, bound, and unbound fasciculi, V i, V ii, VI i, VI ii (the rest wanting). Bonn, 1856.

De Fatis Linguarum Orientalium Arabicæ nimirum Persicæ et Turcicæ Commentatio. Viennæ, 1780. F.

A Dictionary, Persian, Arabic and English, with a Dissertation, &c. J. Richardson. New Edit. By C. Wilkins. Lond. 1806. 2 vols. 4°.

Sabæan Researches. J. Landseer. Lond. 1823. 4°.

Sententiæ Ali Ebn Abi Talebi Arabice et Latine. C. Van Wænen. Oxon. 1806. 4°.

An Arabic Vocabulary and Index for Richardson's Arabic Grammar. T. Noble. Edin. 1820. 4°.

A Hebrew and English Lexicon. W. Gesenius. Trans. by E. Robinson. 4th Ed. Boston, 1850. 8°.

An Historical and Critical Inquiry into the Interpretation of the Hebrew Scriptures. J. W. Whittaker. Cambr. 1819. 8°.

Lexicon Hebraicum et Chaldaicum J. Buxtorfii. Ed. nov. Glasguæ, 1824. 8°.

Institutiones Linguæ Hebraicæ R. Bellarmini. Paris, 1622. 12°.

Dissertationes Miscellaneæ H. Relandi. Traj. ad Rhen. 1706. 12°.

The Israelitish Authorship of the Sinaitic Inscriptions. C. Forster. Lond. 1856. 8°.

A Hebrew Primer. Bishop of St. David's. Pamph. 16 pp. 16°.

Dissertationes Selectæ, varia S. Litterarum et Antiquitatis Orientalis Capita D. Millii. Lugd. Bat. 1743. 4°.

Biblia Hebraica B. A. Montani. (Hebrew text, with interlinear Latin translation and side notes.) 1581. F.

Genesis in Hebrew, with New Translation. De Sola, Lindenthal, and Raphall. Lond. 5604—1844. 8°.

Analysis and Critical Interpretation of the Hebrew Text of Genesis, preceded by a Hebrew Grammar. W. Paul. Edin. and Lond. 1852. 8°.

Introduction to Genesis, with a Commentary on the opening portion. From the German of P. Von Bohlen. J. Heywood. 2 vols. Lond. 1855. 8°.

Questiones Mosaicæ; or, the Book of Genesis compared with the Remains of Ancient Religions. O. de B. Priaulx. London, 1842. 8°.

Genesis Elucidated. J. J. W. Jervis. Lond. 1852. 8°.

Genesis and Exodus. Being the first two volumes of A Historical and Critical Commentary on the Old Testament. By M. M. Kalisch. Lond. 1858 and 1855.

Jewish School and Family Bible, in 3 vols. 8°. A. Benisch. Lond. 1851.

Ascensio Isaiæ Vatis. R. Lawrence. Oxon. 1819. 8°.

Primi Ezræ Libri, Versio Ethiopica. R. Laurence. Oxon. 1820. 8°.

The Times of Daniel. George, Duke of Manchester. Lond. 1845. 8°.

Woodruff on Daniel's 70 Weeks. 4°.

An Explanation of the 70 Weeks. J. Caverhill. Lond. 1777. 8°.

A Chronological Essay on the Ninth Chapter of Daniel. P. Lancaster. Lond. 1722. 4°.

Chronology of the Times of Daniel, Ezra, and Nehemiah. J. W. Bosanquet. Lond. 1848. 8°.

In Librum Danielis R. Rolloci Scoti. Ed. alt. Genevæ, 1610. 16°.

Josippon, sive J. Ben-Gorionis Historiæ Judaicæ Libri Sex. Ex. Heb. Lat. J. Gagnier. Oxon. 1706. 4°.

Historia Imp. Vet. Joctanidarum in Arabia Felice ex Abulfeda. Persian Text. 4°.

Specimen Historiæ Arabum, sive Gregorii Abul Farajii Malatiensis de Origine et Moribus Arabum E. Pocockii. Oxon. 1650. 4°.

The Historical Geography of Arabia (with a Glossary of Hamyaritic Inscriptions). C. Forster. Lond. 1844. 2 vols. 8°.

Miscellanea Phœnicia. H. A. Hamaker. Lug. Bat. 1828. 4°.

Déscription de l'Arabie. C. Niebuhr. Unbound. Amsterdam, 1774. 4°.

Voyage en Arabie. C. Niebuhr. Unbound. 2 vols. Amsterdam, 1776, 1780. 4°.

Receuil de Questions Proposées à une Société de Savants que font le Voyage de l'Arabie. M. Michaélis trad. de l'Allemand. Amst. 1774. 4°.

The Travels of Ibn Batuta. Translated from the Arabic. With Notes. S. Lee. Lond. 1829. 4°.

The Oriental Geography of Ebn Haukal. (X. Cent.) Trans. Sir W. Ouseley. Lond. 1800. 4°.

Récherches et Dissertations sur Herodote. Bouhier. Dijon, 1746. 4°.

Récherches Curieuses sur l'Histoire Ancienne de l'Asie. J. M. Chahan de Cirbied and F. Martin. Paris, 1806. 8°.

A Dissertation on the Geography of Herodotus. With Map. Researches into the History of the Scythians, &c. From the German of B. G. Niebuhr. Oxford, 1830. 8°.

Maured Allatafet Jemaleddini filii Togri-bardii, seu Rerum Ægyptiacarum Annales, 971–1453. J. D. Carlyle. Cantab. 1792. 4°.

Philosophical Dissertations on the Egyptians and Chinese. From the French of De Pauw. Cap. J. Thomson. 2 vols. Lond. 1795. 8°.

Geographia Nubiensis. Arab. et Lat. Sionita et Hesronita. Par. 1629. 4°.

Ægyptiaca. H. Witsii. De Ægyptiacorum Sacrorum cum Hebraicis Collatione. Amstel., 1683. 4°.

Ægyptiarum Originum Investigatio. J. Perizonii. H. Van Alphen Traj. ad Rhen. 1736. 12°.

De Totius Africæ Descriptione. Lib. ix. 1. Leonis Africani in lat. conv. I. Floriano. Antverp., 1556. 12°.

Pantheon Ægyptiorum. P. E. Jablonski. Franc. ad Viadrum, 1750. 8°.

Africa Edrisii. Cur. J. M. Hartmann. Ed. alt. Gott. 1796. 8°.

L'Egypte sous les Pharaons. M. Champollion le Jeune. Paris, 1814. 8°.

Historical Researches into the Politics, &c., of the Carthaginians, Ethiopians and Egyptians. A. H. L. Heeren. Translated from the German. Oxford, 1832. 2 vols. 8°.

Historical Researches into the Politics, &c., of the Principal Nations of Antiquity. A. H. L. Heeren. Translated from the German. Oxford, 1833. 3 vols. 8°.

Précis du Système Hiéroglyphique des Anciens Egyptiens. M. Champollion le Jeune. 2d Edit. Paris, 1827, 1828. Unbound. 2 vols. 8°.

Rig-Veda-Sanhita. H. H. Wilson. Lond. 1850. 8°.

Observations on the Plagues of Egypt. J. Bryant. New Edition. Lond. 1810. 8°.

Origines; or Remarks on the Origin of Several Empires, &c. Sir W. Drummond. 4 vols. Lond. 1824. 8°.

Hermes Scythicus; or, the Radical Affinities of the Greek and Latin Languages to the Gothic. J. Jamieson. Edin. 1814. 8°.

A Dissertation on the Languages, &c., of Eastern Nations. 2d Ed. New Analysis of Ancient Mythology, in answer to Bryant's Apology. J. Richardson. Oxford, 1778. 8°.

Ancient Alphabets and Hieroglyphic Characters Explained in Arabic. By A. Bin Abubekr Bin Wahshih. Englished by J. Hammer. Lond. 1806. Square 8°.

The One Primeval Language. C. Forster. 3 vols. Lond. 2d. Ed. 1852.

A Harmony of Primeval Alphabets. C. Forster. In box cover. 8°.

Ogygia; or, A Chronological Account of Irish Events. Latin. R. O'Flaherty, Esq. J. Hely. 2 vols. Dublin, 1793. 8°.

Phœnician Ireland. J. L. Villaneuva. Englished by H. O'Brien. Lond. Dub. 1833. 8°.

The Rivers of Paradise and Children of Shem. Expedition of Sesostris into India. Maj. W. Stirling. Lond. 1855. 8°.

Reflexions Critiques sur les Histoires des Anciens Peuples, Chaldéens, Hébreux, Phéniciens, Egyptiens, Grecs, &c. M. Fourmont. 2 vols. Paris, 1735. 4°.

Prospectus of a Dictionary of the Language of the Aire Coti or Ancient Irish; with the Language of the Cuti or Ancient Persians; with the Hindoostanee, Arabic and Chaldean. Lieut.-Gen. C. Vallancey. Preface.—Account of the Ogham Tree-Alphabet of the Irish, lately found in an Ancient Arabic MS. in Egypt. Dub. 1802. 4°.

Prosodia Rationalis; or, An Essay towards Establishing the Melody and Measure of Speech by Peculiar Symbols. 2d Edit. Josh. Steele. Lond. 1779. 4°.

Researches into the Origin and Affinity of the Principal Languages of Asia and Europe. Lieut-Col. Vans Kennedy. Lond. 1828. 4°.

Remains of Japhet, being Historical Inquiries into the Affinity and Origin of the European Languages. Jas. Parsons. Lond. 1767. 4°.

Explication de Divers Monumens Singuliers qui ont Rapport à la Religion des plus Anciens Peuples. . . . . l'Astrologie Judicaire; enrichi de figures. R. P. Dom . . . . de St. Maur. Paris, 1739. 4°.

Populorum et Regum Numi Veteres Inediti. Fr. Neumanno. Vindob. 1779. 4°.

Les Origines Indo-Européennes, ou les Aryas Primitifs. Essai de Paléontologie Linguistique. Adol. Pictet. Paris, 1859. Grand 8°.

De Initiis et Originibus Religionum in Oriente Dispersarum quæ Differunt a Religione Christiana. D. G. H. Bernstein. Berol, 1817. Small 4°.

Seder Olam. Chronicon Hebræorum Majus et Minus. J. Meyer. Amstell. 1699. 4°.

Animadversions upon Sir Isaac Newton's Book, entitled The Chronology of Ancient Kingdoms Amended. A. Bedford. Lond. 1728. 8°.

Shuckford's Connections. The Sacred and Profane History of the World Connected. Revised by J. Creighton. First Amer. Ed. Phila. 1824. 4 vols. in 2. 8°.

Prideaux's Connections. The Old and New Testament Connected. H. Prideaux. 18th Ed. 4 vols. Lond. 1821. 8°.

Russell's Connections; with a Folio Atlas. A Connection of Sacred and Profane History. M. Russell. 3 vols. Lond. 1827. 8°.

Chronology. Fr. Parker. Lond. 1858. 8°.

New Analysis of Chronology, &c. W. Hales. 2d Ed. 4 vols. Lond. 1830. 8°.

Sacred Chronology. G. Faussett. Ed. R. Faussett. Ox. 1855. 8°.

Institutionum Chronologicarum Libri 3. G. Beveregium. Lond. 1669. 4°.

Chronologia Sacra-Profana Dicta G. Davidis. R. D. Ganz. Ex. Heb. en Lat. G. H. Vorstium. Lug. Bat. 1644. 4°.

Questiones Chronologicæ de annis Dom. Julian. et Nabonass. R. P. H. Philippi. Col. Agrip. 1630. 4°.

Système Chronologique sur les trois Textes de la Bible, &c. M. Michel, de Toul. Toul, 1733. 4°.

Historia Orientalis. J. H. Hottingero. Tigurino, 1651. 4°.

Asia, sive Historia Universalis Asiaticum, &c. . . . . Sacri Profanique Ritus. J. Baptista de Gramaye Arnhemiensi. Antv. 1604. 4°.

Historia Compendiosa Dynastiarum, auc. G. Abul-Pharajio. Arab. ed. et Lat. ver ab E. Pocockio. Oxon. 1663. 4°.

L'Antiquité des Temps Rétablie et Défenduë, contre les Juifs et les Nouveaux Chronologistes. Par le Père Pezron. Paris, 1687. 4°.

Eusebii Pamphili Chronicorum Canonum libri duo. I. Zohrabo. Mediolani, 1818. F.

Chronicus Canon Ægyptiacus, Ebraicus, Græcus, et Disquisitiones D. T. Marshami. Lond. 1672. F.

Chronicon Orientale nunc Primum Donatum ab. Abr. Ecchellensi Syro Maronita e Libano, &c. Paris, 1651. Grand F.

Chronological Antiquities, or the Antiquities and Chronologies of the most Ancient Kingdoms, &c. J. Jackson. Lond. 1752. 3 vols. Grand 4°.

Récherches sur l'Origine, l'Esprit, et les Progrès des Arts de la Grèce; sur leurs Connections avec les Arts et la Religion de plus Anciens Peuples Connus, &c. Lond. 1785. 3 vols. 4°.

ΦΩΤΙΟΥ ΜΥΡΙΟΒΙΒΛΟΝ Η ΒΙΒΛΙΟΘΗΚΗ. Lat. vero peddidit et scholis auxit A. Schottus Antverpianus. Genevæ (O. P. Stephani), 1611. F.

ΠΑΣΧΑΛΙΟΝ seu Chronicon Paschale a mundo condito ad Heraclii Imp An. XX, cum nova Lat. ver. not. Chron. et Hist. Cur. Caroli du Fresne, D. du Cange. Paris, 1688. F.

Commentaire Géographique sur l'Exode et les Nombres. Leon de Laborde. Unbound. Paris et Leipsig, 1841. F.

Codex apocryphus novi testamenti, collectus, castigatus, testimonisque, censuris et animadversionibus illustratus à J. A. Fabricio. Hamb. 1703. 16°.

Acta, Epistolæ, Apocalypses, alia Scripta Apostolis falso inscripta, sive Codicis Apocryphi Novi Testamenti. Tom. II. 12°.

J. Perisonii, Ant. F. Animadversiones Historicæ, &c. Amstell. 1685. 16°.

Græca Linguæ Historia. F. Burtono. Lond. 1657. 16°.

Transactions of the Literary Society of Bombay. Vol. I. Lond. 1819, Vol. II 1820, Vol. III 1823.

Journal Asiatique ou Receuil de Mémoires, &c., relatifs à l'Histoire, &c., des Peuples Orientaux. Redigé par MM. Chézy, &c. &c., et Publié par la Société Asiatique. Paris. Vol. I 1822, II 1823, III 1823, IV 1824, V 1824, VI 1825, VII 1825, VIII 1826, IX 1826, X XI 1827. (Rest wanting.)

The Journal of the R. Asiatic Society of Great Britain and Ireland. Lond. 8°. Vol. X i 1846, ii iii 1847, XI i ii 1849, XII 1850, XIII i 1851, ii 1852, XIV duplicate of i 1851, XV i 1853, ii 1853, XVI i 1854, ii 1856. (Rest wanting.)

Twenty-ninth Annual Report of R. Asiatic Society, 1852. Pamph. Relating to Rawlinson's and Layard's Discoveries.

Transactions of the Chronological Institute of London. Part I 1852, Part II 1857, Part III 1858.

Dr. Wilcocks presented for publication in the Transactions, a memoir entitled: "Thoughts on the Influence of Ether in the Solar System; its relations to the Zodiacal Light, Comets, the Seasons, and Periodical Shooting Stars;" which, on motion, was referred to a Committee consisting of Prof. Kendall, Prof. McClune, and Mr. Marsh.

Dr. Wilcocks read the following synopsis of the communication:

The paper describes briefly the ideas entertained of Ether by the Hindoos, as well as by two of the schools of Greece; but asserts that it is not by the aid of any such fluid that I shall undertake to explain the cause of the phenomena mentioned in the title. My only purpose in dwelling upon the ancient theories is, to show how they have biased the minds of modern astronomers.

The discovery of Professor Encke, I have offered as the first rational evidence of the existence of a resisting medium in space, and have made a suggestion regarding the density of the Ether in different parts of the solar system.

The fact of our intercourse with matter being altogether with gross substances, I have urged as the great difficulty of appreciating the nature of ether; and have proposed that while discussing the

subject, we should endeavor to lay aside notions of matter already acquired, and try to view it as we believe it to exist in the celestial spaces.

The physical constitution of the sun, as received by the best authorities, I have described as far as I believe it to influence the motion of the ether. The rotation of that orb upon its axis, with the position of the latter with reference to the ecliptic, I have recounted; also the observations of Secchi upon the relative heat of different parts of the sun's surface, and the influence of this difference of heat in determining the character of the ethereal currents.

After duly considering the effect of these agencies upon each other, the conclusions are reached that the ether in the solar system is in constant motion, that it performs a circulation from the sun's poles to the equator, and thence into the region of the planets, and finally returning to the sun's poles, descends thereon in the form of vortices; that the shape of the mass, as it advances into space, is that of a huge plate, or more precisely a hollow cone, whose apex forms a highly obtuse angle at the sun's centre.

The existence of reflecting matter in the ether is shown from the corona of light seen round the moon during a total eclipse of the sun.

It is suggested that a perspective view of the ascending current of ether, as it advances through the region of the planets, produces the appearance known as the zodiacal light.

The weak points of former explanations of this phenomenon are exposed, and the claim urged that the theory of ethereal currents, derived altogether from independent data, affords the best explanation.

All the positive information we have upon the subject of ether is derived from its effect upon comets, but long before Encke's day, Sir Isaac Newton had undertaken to explain some of the most prominent features of these bodies, upon the hypothesis of their moving through a material fluid.

The views of Newton, with respect to the position of the tails of comets, I have noticed, with the reflection, that neither in his own day nor ours have his ideas upon the subject received that support from astronomers to which their merit entitles them. I have suggested several reasons to account for the fact.

The ingenious and plausible hypothesis of M. Valz respecting the density of the ether in the solar system, is described, with his expla-

nation of the reduction of volume in comets on approaching the sun, and their subsequent increase on receding from that luminary.

The non-concurrence of M. Arago and Sir John Herschel in the theory of M. Valz is given as evidence of the influence of the ancient theories of ether at the present time upon the minds of astronomers.

The existence of the ascending current of ether near the ecliptic is offered in explanation of certain peculiarities of Halley's comet, which have been observed in five of the eight visits which that body has made to its perihelion since the year 1305.

The vortical currents which descend upon the poles of the sun, are urged as the causes of the exceptional position of the tails of such comets as have passed through them.

The catalogues of comets in the works of M. Arago and Mr. Hind show that the orbits of all those bodies which have had tails directed towards the sun, have had an inclination of more than seventy degrees, and a perihelion distance less than one-fourth the radius of the earth's orbit.

The ascending current of ether which, owing to the reflecting matter which it contains, becomes visible to us as the zodiacal light, cannot be of as low a temperature as the surrounding medium.

In order to show the influence of ether upon the seasons, I have traced, by the aid of *à priori* reasoning, the path of the ascending current through the solar system.

I have determined by calculation the points where the earth passes through the current, and endeavored to demonstrate that the first passage occurs in the month of August, and produces the canicular days; the second passage takes place in November, and is the cause of the season known as the Indian summer.

Several minor influences of the ethereal currents upon the seasons are suggested, and the effort made to connect, through the relation of cause and effect, these influences with known phenomena.

A belief in the ethereal origin of the dog-days and the Indian summer, naturally leads to the inquiry, May not the numerous sporadic shooting stars seen about the 10th of August, and the showers of them sometimes seen on the 12th of November, proceed from the same cause? Under the impression that this might be the case, I was induced to search for the existence of some numerical coincidence between the grand November exhibitions of shooting stars, and the sidereal year.

I found that the number of days between the years of the great

exhibitions, 1799 and 1833, was 12418.704, and that the number of days in 487 rotations of the sun are 12418.5, the difference being only four hours and forty-eight minutes.

It is, therefore, proved that any part of the sun's surface turned towards the earth, at any given point in its orbit, in the year 1799, was also turned towards the earth at the same point of its orbit, in 1833, and will be again in 1867 and 1901.

Messrs. Bunsen and Kirchoff have ascertained that the sun's atmosphere contains metals in the vaporous state.

If we permit ourselves to believe that a portion of this metallic vapor escapes from the sun's atmosphere without undergoing the chemical change which produces the light and heat, and if this metallic vapor be transported to the earth's orbit by the ethereal current, it will be liable to an encounter with our planet in those parts of its yearly path, where it passes through the ascending current of ether, viz., in August and November.

If, in addition to this, we believe that a certain part of the sun's surface either constantly or frequently emits this metallic stream, the periodical recurrence of the meteoric shower may be looked for at intervals of thirty-four years.

I have illustrated my theory with several diagrams, which are based upon the observations of astronomers of established reputation. One of these diagrams shows the relation between the sun's equator, the ecliptic, and the ascending current of ether. The distance of the earth from the last at different seasons of the year, is made apparent. On comparing it with the table of MM. Coulvier, Gravier, and Saigey, a curious agreement is shown to exist between the distance of the earth at different seasons from the ascending current of ether, and the occurrence of shooting stars.

I have resigned the subject with the conviction that as it is one of immense interest, and has received no justice at my hands, it will speedily excite the attention of those who have made special studies of the various phenomena which I have endeavored to combine under one cause.

The Committee on Mr. Oliver's note to Mr. Chase's memoir, to be published in the Transactions, reported in favor of its being published with the memoir; which, on acceptance of the report, was so ordered.

Mr. Foulke presented for the Library a copy of the libretto of Mr. Fry's new opera of Notre Dame of Paris, and spoke

of the adaptability of sounds, especially the vowel sounds of the English language, to musical compositions of this order.

Mr. Foulke exhibited, also, a curious specimen of a triple orange.

Prof. Lesley made a communication on the Abbeville quarries, which led to a discussion on the subject of the sufficiency of the evidence, as yet obtained, for the alleged super-antiquity of the human remains found in the diluvium; Dr. Goodwin especially objecting the high authority of M. Elie de Beaumont, and the doubts resting upon the precise relationship of the Loess.

The interesting discussions of the last three years over the views of our fellow-member, M. Boucher de Perthes, and especially the fresh discussions to which the alleged discovery of a human jaw near Abbeville had given an impetus, induced me to visit his famous collection and the quarries from which his earlier specimens had been obtained. In London, I had learned that the English geologists had accepted the genuineness and diluvial antiquity of the implements, but rejected that of the jaw. In Paris, I found, on the contrary, that the geologists, with the exception perhaps of M. Elie de Beaumont, and also the ethnologists, had agreed to place the jaw in the same category with the implements. Dr. Broca, the Secretary of the Anthropological Society, had the goodness to show me the manuscript report of the joint commission of English and French savants, since published by the Academy, authoritatively declaring its genuineness. On my return to England, Mr. Evans assured me that the jaw was a forgery, and that he had proven the forgery of many of the implements also.

The change of view manifested by Sir Charles Lyell in his recent work on the Antiquity of Man, in relation to the genuineness and antiquity of the Natchez *pelvis*, had been commented on with much interest and some surprise, as opposed to the current of English sentiment respecting the whole subject. Sir Charles, when in America, had convinced himself that Dr. Dickeson's *pelvis* was a mistake, it being merely the *os innominatum* of some Indian girl, fallen from an ancient graveyard at the surface above, among the debris of the cliff formation which held the extinct remains of the post-pleiocene period. Those of us who were present at the meeting of the Academy of Natural Sciences in Philadelphia, at which Dr. Dickeson presented the bone to the Cabinet, will remember the indif-

ference with which it was presented, and the silence with which it was received The fact is, no one was prepared, twenty years ago, for such a fact It was as blinding and unpleasant as a flash of sunlight in a mirror. The intellectual eyes of science must become accustomed to such astounding discoveries. It required thirty years to produce a state of science in Europe susceptible to the impression which M. Boucher de Perthes' cabinet had a destiny to make. And nearly as long a time was required to obtain for the Natchez pelvis the first reception into the text-book of a distinguished geologist. At the instigation of Dr. Falconer, I am happy to say that Dr. Leidy has promised to renew the discussion of this bone by instituting a chemical and microscopic examination of its condition. We may then know more about its antiquity. But since the discovery by M. Desnoyers of pleiocene fossil bones, scratched and cloven by the hands of men, there is no longer any good reason for throwing doubt upon its alleged geological position.

The distinguished chief of geology in France, M. Elie de Beaumont, is understood to occupy solitary ground in the matter of the Abbeville implements. Their antiquity depends upon that of the formation in which they lie, and upon the fact that they lie in it mixed with the bones of extinct species of animals. If the formation be strictly *in situ*, there is no escape from the conclusion that the implements and the bones are of equal age, and therefore that Man lived with these extinct animals. If, on the contrary, it can be shown that the formation is an after-make, a slide from above, a debâcle, a local deposit hastily brought together from different neighborhoods, the argument for the antiquity of the implements is lost. Elie de Beaumont is said to assume Cuvier's view of the formation, and calls it a slide from the upland into the valley of the Somme, and then denies the antiquity of the implements.

It was especially with a view to form an opinion upon this point that I visited Abbeville; and after enjoying the same courteous reception from M. Boucher de Perthes that he accords to all strangers, I examined the quarries in the neighborhood; first, that of Moulin Quignon, where the jaw was said to have been found; and then those of Menchecourt. The former had so fallen in that I could not obtain access to the depth at which the jaw is placed. But I saw no reason to imagine any change in the original condition of the deposit. There is no escarpment or steep valley wall to give the remotest chance of a slip. The whole valley is shallow, and the slopes are so gentle that it is hard to say where the valley ends and

the table-land begins. Whatever the age of the gravel and loam, they undoubtedly rest upon the old topography of the chalk just as they were at first deposited upon it.

Returning through the old city and going out over its moats in the opposite direction, I was driven through the long one streeted-village of Menchecourt. Behind the houses, at the distance of a hundred yards, are the quarries, with their common floor on a level with the site of the village and their vertical faces, or stopes, rising behind to the height of from twenty to thirty feet, no more. As they are slowly cut back into the upland, the stoping becomes higher; but so gentle is the slope of the land, in that direction, that years will be consumed in obtaining a face of twice that height. There is not the least appearance of a slide anywhere. The soil above, the layers of broken flint and loam, are evidently in their normal condition. The original stratification is nowhere concealed or confused by subsequent movements from above. The "falsebedding" or oblique deposition is curiously visible, and affords abundant evidence of the diversity of currents which introduced the materials. In a few places the subordinate members of the section express themselves by waved lines, suggesting lateral pressure, but not in the form so well known to geologists, where the mass is broken and crumpled by a side thrust or by a slip of the upper upon the under strata. The characteristic feature of all quiet, loamy, and sandy deposits, viz., the isolation of lenticular belts of one stratum inside of the limits of the stratum next above or below, is beautifully exhibited. The distribution of the chalk fragments is also open to easy study. But the most striking appearance is that presented by perfectly horizontal parting planes, marked sometimes by thin beds of equally distributed broken flints. Such are, for example, the two lines between b and c, and c and d, in Fig. 1, Plate VII.

In this section, *a* represents a layer of broken flints, no doubt a river shore. It passes down into a fine loamy sand. Beneath the second thin horizontal sheet of broken flint, the mass of loam *d* is stratified in lenses, alternately greenish and yellowish. No chalk or gravel is seen at the floor of the quarry here.

Fig. 2, is a section about 100 paces west of Fig. 1, *a*, 1½ metres thick, is a stiff clay, with a few broken flints at the top and at the bottom; *d*, a reddish, yellowish clay, tolerably well filled with broken flints; *b*, 1 metre, is quite filled with broken pieces of chalk and broken flints; *c*, is a perfectly homogeneous mass of drab or dove-colored loam, 2 metres of which are visible, and no floor.

Fig. 3 lies still further west, along the face of the back wall of the quarry, and shows the streams or streaks of broken flints appearing and disappearing in the body of the mass of yellowish loam; *a*, is the upper covering of humus. The section is on the same scale with that of Figs. 1 and 2. But the scale of Fig. 4 is enlarged to show the engagement of white loam (*d*), in waved lenses, parallel to each other, in the body of the homogeneous mass of darker, slightly reddish loam (*c*); and *vice versa* the appearance of waved lines and lenses of *c* in the lower part of *b*; *a* is an overlying stratum of coarse loam, charged with flint, and resting on a layer of broken flints; *b* is a homogeneous mass of yellow loam.

It is apparent from these sections that the formation is in its pristine condition. The floor of chalk appears suddenly and at an unexpected height, within two or three paces of Fig. 4, forming as it were, a little cliff in the deposit, but no special collection of broken flints lies in immediate contact with it, and but a very few fragments of chalk, and those of a very small size. There is no appearance of tumultuous deposition in the faces of these quarries. The shore must have had a gentle slope, and no wide sheet of water before it; otherwise, the powerful waves of a great lake or ocean frith, would have left their common marks. The width of the valley of the Somme, as it now exists, could not have been greatly exceeded; and if we suppose a river current, we can understand why the flint implements should fall from canoes or floats, or favorite fishing stations, and lie where they fell, while the naked corpse of any unfortunate savage drowned at his trade would be floated out to sea.

There is no reason to suppose any great physical break in the history of man upon the earth. Granted that the English Channel has been eroded; the action was perhaps characterized by a deliberate regularity. Granted that the change which determined the incipient necessity for its erosion, was some great change of sea level in Northwestern Europe; it does not follow that the change, however great, was not equally gradual. We may regard the banks of the Somme as haunted by men from the beginning of human life in Europe; whether they were washed by a small river, or by the narrow arm of the sea. No doubt there have been epochs of entire submergence, during which all Northern France was once more made a shallow sea, like the North Sea now. But the race of men and the races of beasts may have retired so slowly before the scarcely noticeable advance of the sea level edge, and so slowly pursued it on its retreat again, as not to have been aware of any change in what to them was

a fixed and unalterable state of things in the relation of land to sea. Thus similar changes go on now; why should we imagine it otherwise in ancient times? Until we can prove it to have been otherwise, we have no right to apply with rigor the epithet antediluvian to these remains of man.

I may add, that on my way to Neuchâtel to visit my friend Prof. Desor, and while I was being entertained in the most delightful manner by M. Troyon, with an inspection of the many rare piloti relics in his museum at Lausanne, I learned that Desor was in Africa with two other members of a commission of the French Government, studying the age of the Sahara. Sketches of their results have been published by him since their return, by which we learn that they have fully confirmed the opinions of previous explorers, that the north of Africa has risen very recently from beneath sea level, probably in the human age. Or, perhaps we should say, as Herr Trautschold would have it (Zeitsch. der Geol. Gesell. 1863, p. 411), the ocean bed has deepened itself since man was created, so as to drain the whole Sahara and Libyan desert land. The commission found the *Cardium edule* not only embedded within the rock of the desert, but at a fixed horizon over some hundred miles of their route, and this shell fish was the chief food of the savages of the stone age.

The obliteration of so much sea surface, whether rapidly or slowly effected, must have produced one of the greatest alterations in the physical condition of the surface of the earth, on that side of it. While the Mediterranean waters covered Northern Africa (with the exception of the Atlas Mountains, the Abyssinian highlands, and other unknown mountain ranges under or beyond the equator), more humid winds must have fertilized Arabia, Persia, and Bokhara, and ameliorated the rigors of Thibet and China, if it could not quite prevent the formation of the Desert of Tobi. On the other hand, rains must have swollen the Caspian and Aral seas to such a height, that they then made but one, overflowing the lower steppes and confounding themselves with the Azof and Black Sea shores, and with the Northern Ocean.

If, then, mankind appeared on earth previous to the drying up of the Sahara, he had three widely separated continents to appear upon: Southern Africa, Eastern and Southern Asia, and Western Europe. If the change from that condition of things to a condition of things analogous to that we see now, was accomplished with sufficient rapidity to permit of the formation of a tradition, such tradition could hardly assume any other shape than that of the Noachian deluge.

Ignorant of the cause, the manner, and the extent of the change, the imagination of savages would recast the facts in the mould of their daily experience.

We can understand, also, on this hypothesis, why the Arkism of mythology finds its classic land in Africa, and becomes Helio-arkism only in Asia. A subject which I should be glad to find the time to discuss at length before the Society.

Neither the growth-rings of the trees on the Ohio valley mounds, nor the cypress layers in the Delta of the Mississippi, nor the coral reef series of Florida, nor the thickness of the Somme Valley peat, nor that of the stalagmite cover of the fossil clay of the caves, nor the borings made in the Memphis sands at the foot of the monuments, have afforded us even an approximate scale of years wherewith to measure man's residence on earth. The Cone of the Tinnière, near Villeneuve, has yielded to Prof. Morlot the first precise statement of human time made by human fossils. As he reads it, the bronze age dates back from our time from 2900 to 4200 years, and the stone age from 4700 to 7000 years. (Etudes Géol. Archiv. Bull. Soc. Vaud. vi, p. 325.) M. Gillieron makes the age of his lake habitation relics at least 6750 years. (Actes de la Soc. Jurass. d'Emulation, 1860.) But these are both merely common historic dates.

If, however, I have not misunderstood a communication made to me by our fellow-member, Dr. A. A. Henderson, of the U. S. Navy, there exists a singularly perfect scale of years for archæologists, under the tropics, wherever the wet and dry seasons are semi-annual and regular. Near Rio Janeiro are certain caves in limestone, containing the usual accumulations of stalactitic and stalagmitic matter, the latter covering a bone clay, in which the implements of man have been found, chiefly arrowheads. Dr. Ildefonso, the well-known botanist and naturalist of Rio Janeiro, informed Dr. Foltz that he had made himself well acquainted with the caves of the Provinces of Minas Duras, and Santos, and their contents, and that his daughter had repeatedly counted the delicate layers of the lime deposit over the bone clay, produced by the seasons of rain and percolation, interrupted by dry seasons of dusty weather, during which, there being no percolation from the surface through into the caves, there consequently was no deposit of alabaster, but in lieu of it a deposit of dust; and he declared that the number of the layers amounted to twenty thousand (20,000). Should this curious observation be repeated and accepted, the question of the great antiquity

of man will be set at rest; and both those who believe in the original unity, and those who believe in the original diversity of races, will have that free scope given to their theoretic methods which a practically unlimited amount of time at their command is calculated to afford. Dr. Ildefonso is understood to assert that the annual character of the laminæ has been confirmed.

Pending nominations Nos. 522, 523, 524, were read, and the Society was adjourned.

Stated Meeting, June 17, 1864.

Present, six members.

Prof. TREGO, Secretary, in the Chair.

Letters accepting membership were received from G. Kirchhoff, dated Heidelberg, June 2d, and from Otto Heer, dated Zurich, April 10th, 1864.

Letters acknowledging the receipt of publications were received from the Boston Athenæum, May 31st; Boston Library, June 7th; Connecticut Historical Society, May 23d; New York State Library, May 21st; New York Historical Society, May 19th; Washington Observatory, May 18th, and Chicago Historical Society, May 19th, 1864.

Donations for the Library were received from the Government of the Netherlands, Bureau des Mines, Royal Astronomical Society, Essex Institute, Harvard and Yale Colleges, Prof. Tyler, of Amherst, American Oriental Society, New York Lyceum, New York Historical Society, Academy of Natural Sciences, Franklin Institute, and Brigadier-General Dr. Hammond.

Photographic likenesses of S. F. B. Morse, Lewis Agassiz, Oswald Heer, Spencer F. Baird, E. W. Brayley, and J. F. W. Herschel, were received for the album.

The committee to which was referred the paper of Dr. Wilcocks at the last meeting, reported in favor of its publication in the Transactions. On motion, the report was accepted and agreed to.

Mr. Chase made the following communication:

The remarkable coincidence which I have pointed out, between the theoretical effects of rotation and the results of barometrical observations, has led me to extend my researches with a view of defining more precisely some of the most important effects of lunar action on the atmosphere. The popular belief in the influence of the moon on the weather, which antedates all historical records, has received at various times a certain degree of philosophical sanction. Herschel and others have attempted partially to formulate that influence by empirical laws; but the actual character of the lunar wave that is daily rolled over our heads appears never to have been investigated. Major-General Sabine showed that the moon produces a diurnal variation of the barometer, amounting to about .006 of an inch, which is equivalent to nearly one-tenth of the average daily variation near the equator. This would indicate a tidal wave of rather more than one foot for each mile's depth of atmosphere, or from three to six feet near the summits of the principal mountain chains. It is easy to believe that the rolling of such a wave over the broken surface of the earth may exert a very important influence on the atmospheric and magnetic currents, the deposition of moisture, and other meteorological phenomena. As the height of the wave varies with the changing phases of the moon,* its effects must likewise vary, in accordance with mathematical laws, the proper study of which must evidently form an important branch of meteorological science.†

Besides this daily wave, there appears to be a much larger, but hitherto undetected, weekly wave. M. Flaugergues,‡ an astronomer at Viviers in France, extended his researches through a whole lunar cycle, from Oct. 19, 1808, to Oct. 18, 1827, and he inferred, from his observations:

1. That, in a synodical revolution of the moon, the barometer rises regularly from the second octant, when it is the lowest, to the second quadrature, when it is the highest; and then descends to the second octant.

2. That the varying declination of the moon modifies her influ-

* The height at St. Helena appears to fluctuate between about .9 and 1.6 feet.

† For some interesting experimental evidences of the effect of the moon's changes on the fall of rain, see the published observations of Messrs. F. Marcet (Silliman's Journal, 27, 192), and J. H. Alexander (Silliman's Journal, N. S., 12, 1).

‡ Bib. Univ., Dec. 1827, and Silliman's Journal, 15, 174.

ence, the barometer being higher in the northern lunistice than in the southern.

3. That the action of the moon also varies with its distance from the earth, the mean barometric height being less in perigee than in apogee.

The observations indicate the following average meridional fluctuations of the barometer:

1. In a semi-synodical revolution, 1.67 mm., or .065 in.
2. Between the lunistices, 29 mm., or .011 in.
3. Between perigee and apogee, 1.12 mm., or .044 in.

The more recent and more complete observations at St. Helena give somewhat different results, which serve to confirm the natural *à priori* conviction that there must be two maxima and minima in each month. The means of three years' hourly observations indicate the existence of waves, which produce in the first quarter a barometric effect of + .004 in.; in the second quarter of — .016 in.; in the third quarter of + .018 in.; and in the fourth quarter of — .006 in.; results which appear to be *precisely* accordant, in their general features, with those which would be naturally anticipated from the combination of the cumulative effect of the moon's attraction with the daily wave of rotation, and the resistance of the æther.

One peculiarity of this lunar-aerial wave deserves notice for the indirect confirmation that it lends to the rotation theory of the daily aerobaric tides, and the evidence it furnishes of opposite tidal effects, which require consideration in all investigations of this character. When the daily lunar tides are highest their pressure is greatest, the lunar influence accumulating the air directly under the meridian, so as to more than compensate for the diminished weight consequent upon its "lift." But in the general aerial fluctuations, as we have seen, and also in the weekly tides, a high wave is shown by a low barometer, and *vice versâ*. The daily blending of heavy and light waves produces oscillations, which are indicated by the alternate rise and fall of the barometer and thermometer at intervals of two or three days.

M. Flaugergues' observations at perigee and apogee seem to show that a portion of the movement of the air by the moon is a true lift, which, like the lift of rotation, must probably exert an influence on the thermometer as well as on the barometer. On comparing the daily averages at each of the quadratures and syzygies, I found the difference of temperature too slight to warrant any satisfactory inference; but a similar comparison of the hourly averages, at hours

when the sun is below the horizon, gave such results as I anticipated, as will be seen by a reference to the following

TABLE OF BAROMETRIC AND THERMOMETRIC MEANS AT THE MOON'S CHANGES.

Moon's Phase.	Average height of Barometer in inches.	Height of Weekly Tides.	Height of Daily Tides.	Height of Thermom. Daily Average.	Thermom. at 12 P.M.	Thermom. at 4 A.M.
Full, . .	28.270	—.0115 in.	.0054 in.	61.67°	60.22°	59.787°
Third Qr. .	28.289	+ .0065 "	.0087 "	61.68	60.41	59.824
New, . .	28.282	+ .0005 "	.0064 "	61.65	60.31	59.716
First Qr. .	28.286	+ .0044 "	.0047 "	61.63	60.37	59.823

In obtaining the above averages I was obliged to interpolate for such changes as took place on Sundays or holidays, when no observations were taken. The interpolation, however, does not affect the general result; and, on some accounts, the table is more satisfactory than if the observations had been made with special reference to a determination of the lunar influences, accompanied as such a reference would very likely have been by a bias to some particular theory.

The thermometric and barometric averages show a general correspondence in the times of the monthly maxima and minima,—the correspondence being most marked and uniform at midnight, when the air is most removed from the direct heat of the sun, and we might therefore reasonably expect to find the clearest evidences of the relation of temperature to lunar attraction.

By taking the difference between the successive weekly tides, we readily obtain the amount of barometric effect in each quarter. The average effect is more than three times as great in the second and third quarters, as in the remaining half month,—a fact which suggests interesting inquiries as to the amount of influence attributable to varying centrifugal force, solar conjunction, or opposition, temperature, &c.

Although, as in the ocean tides, there are two simultaneous corresponding waves on opposite sides of the earth, these waves are not of equal magnitude, the barometer being uniformly higher when the moon is on the inferior meridian, and its attraction is therefore exerted in the same direction as the earth's, than when it is on the superior meridian, and the two attractions are opposed to each other.

I find, therefore, marked evidences of the same lunar action on

the atmosphere as on the ocean,—the combination of its attraction with that of the sun producing both in the air and water, spring tides at the syzygies, and neap tides at the quadratures; and I believe that the most important normal atmospheric changes may be explained by the following theory:

The attraction and rotation-waves, as will be readily seen, have generally opposite values, the luni-solar wave being

Descending, from 0° to 90°,* and from 180° to 270°.

Ascending, from 90° to 180°, and 270° to 360°.

While the rotation-wave is

Ascending, from 330° to 60°, and 150° to 240°.

Descending, from 60° to 150°, and 240° to 330°.

From 60° to 90°, and 240° to 270°, both waves are descending, while from 150° to 180°, and 330° to 360°, both are ascending. In consequence of this change of values, besides the principal lunar maxima and minima at the syzygies and quadratures, there should be secondary maxima and minima at 60° in advance of those points.

The confirmation of these theoretical inferences by the St. Helena observations appears to me to be quite as remarkable as that of my primary hypothesis. If we arrange those observations in accordance with the moon's position, and take the average daily height of the barometer, we obtain the following

TABLE OF THE LUNAR BAROMETRIC TIDES.

MOON'S POSITION. θ	MEAN DAILY HEIGHT OF BAROMETER AT ST. HELENA. 28 inches + the numbers in the Table.			
	1844.	1845.	1846.	Average. 1844–6.
0°	.2621	.3020	.2701	.2781
15	.2650	.3058	.2693	.2800
30	.2707	.3153	.2707	.2856
45	.2691	.3165	.2688	.2848
60	.2625	.3077	.2688	.2797
75	.2682	.3093	.2783	.2853
90	.2667	.3184	.2800	.2884
105	.2593	.3170	.2721	.2828
120	.2595	.3124	.2686	.2802
135	.2677	.3099	.2691	.2822
150	.2712	.3118	.2715	.2848
165	.2710	.3104	.2735	.2850
180	.2621†	.3020	.2701	.2781

* Counting from either syzygy.

† Since the tabular numbers represent the *semi-axes* of the barometric curve, and not the simple *ordinates*, the values for 0° and 180° are the same.

This table shows—

1. That the average of the three years corresponds *precisely* with the theory, except in the secondary maximum, which was one day late.

2. That the primary maximum occurred at the quadratures in 1845 and 1846, and one day before the quadratures in 1844.

3. That the primary minimum occurred at the syzygies in 1844 and 1845, and one day after the syzygies in 1846.

4. That 1846 was a disturbed year; and, if it were omitted from the table, each of the remaining years, as well as the average, would exhibit an entire correspondence with theory, except in the primary maximum of 1844.

5. That 1845 was a normal year, the primary and secondary maxima and minima all corresponding with theory, both in position and relative value.

6. That the deviations from perfect correspondence with theory can be easily explained by the relative positions of the two aerial ellipsoids of rotation and attraction.

7. That the tertiary maxima and minima, or the turning-points between the primary and secondary maxima and minima, are less stable than the primaries and secondaries.

At extra-tropical stations I should look for important modifications of the theoretical results, some of which I propose to explain in a future communication.

Mr. Lesley drew the attention of the members to the researches of M. Delesse on the quantity of "water of imbibition" and "water of the quarry" contained in rocks, published in the Bulletin of the Geological Society of France (2e ser. t. xix, p. 64, séance du 4 Nov., 1861), as having an important bearing on the ancient changes of sea-level.

The tables of M. Delesse, given on pp. 66, 69, 72, go to show that dry specimens of gypsum, limestone, chalk, slate, sandstone, gneiss, granite, &c., can be made to imbibe an amount of water equal to from 1 per cent. to 40 per cent. of their weight; and that in their natural places they hold from 1 per cent. to 30 per cent. of water permanently; granite holding 15 per cent.; argillaceous rocks 20 per cent. or more; and the magnesian rocks a still larger percentage. The whole exterior of the crust of the earth is bathed in

surface water, which penetrates all its formations, and descends step by step to a depth, which is probably limited by the horizon of radiant heat equal to 100° C., that is, to a depth of at least two miles. At various stages the descending percolation, aided by a universal fissure and crevasse system, forms water horizons and reservoirs, subject to enormous hydraulic pressure, reproducing the water at the surface, either through natural springs or artificial wells. It is not too much to say, then, that 20 per cent. of the crust of the earth, to a depth of two miles, consists of disseminated and collected water. This will take into account condensation descending.

What, then, was the case in early days when the horizon of 100° C. was at the surface? We must conclude that all this water was at that time excluded from the crust, and compelled to remain above the surface as heated ascending aqueous vapor, and descending rain; and, of course, keeping the general sea-level higher than at present.

Taking the mean density of all rocks near the surface at 3 00, the 20 per cent. of water contained in a stratum of crust two miles deep, will represent more than six hundred feet of water in mass; and, taking one-third of the earth's surface as land, and confining the desiccation to the land surface alone, we have an elevation of the general level of the other two-thirds, or ocean-surface of the planet, equal to four hundred feet; enough to submerge a considerable percentage of the area of each one of the existing continents.

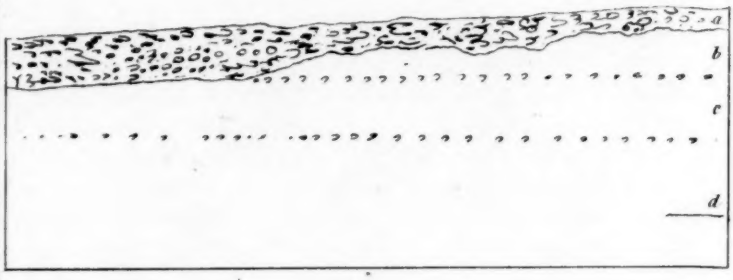
Pending nominations Nos. 522, 523, 524, and new nomination No. 525, were read.

On motion of the Librarian, seconded by Dr. Coates, it was ordered, that copies of Part I of the Catalogue be sent with Part I, Volume XIII, of the Transactions, in the next distribution, to Corresponding Societies which receive the Transactions.

And the Society was adjourned.

Fig. 1.

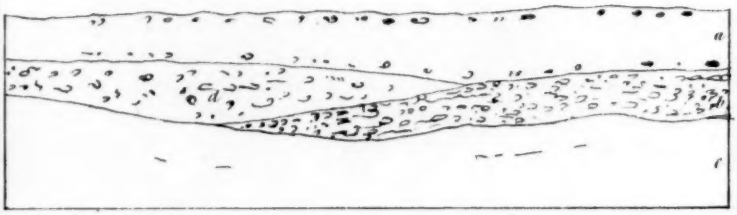
Menchecourt Quarry. East End.



8 inches

Fig. 2.

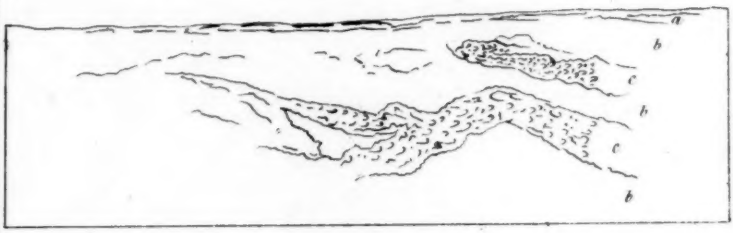
Menchecourt Quarry. West End.



15 inches

Fig. 3.

Menchecourt Quarry. West End.



5 inches

T. Sedgwick lith. Fr.

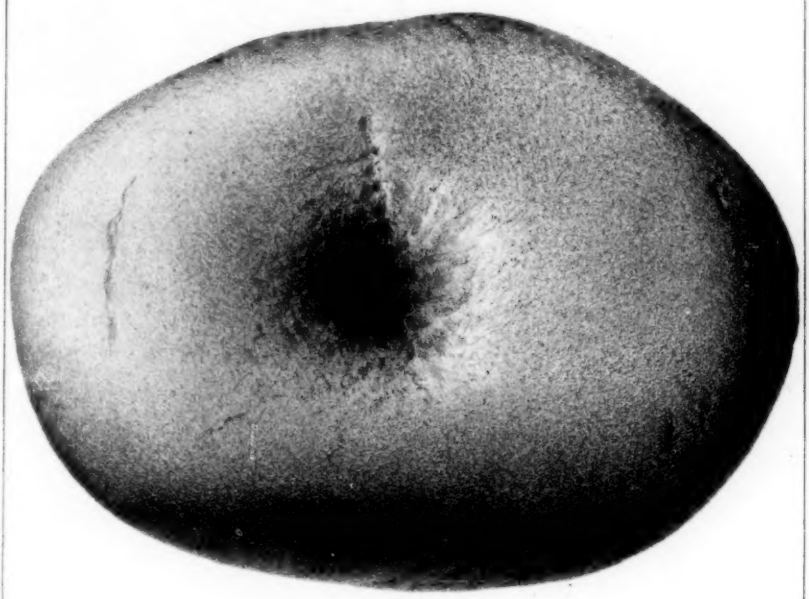
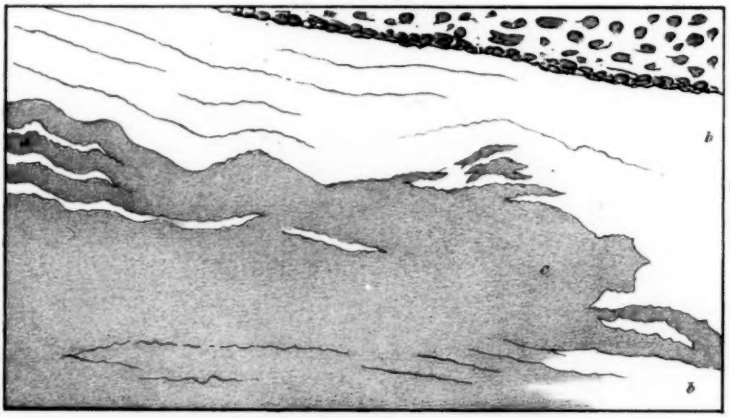


Fig 4. *Menchecourt Quarry. West End.*



Chalk floor appears within 2 yards of this exposure

T. Sinclair lith. Ed.

The following photographs of members have been received. Members whose names are not in the list below are requested to favor the Society with their Photographs, signed with their Autographs at the foot of the card.

Agassiz, L.
Bache, A. D.
Baird, S. F.
Bancker, C. N.
Bancroft, S.
Barnes, Al.
Bigelow, J.
Blackwell, T. E.
Böhtlingk, O.
Brayley, E. W.
Bridges, R.
Buch, L. Von
Carey, H. C.
Carson, J.
Casem Beg, A.
Chase, P. E.
Coates, B. H.
Cohen, J. J.
Coles, E.
Condie, D. F.
Coppée, H.
Crévecœur, J. B. de
Dana, J. D.
Darlington, W.
Dawson, J. W.
Delesse, A.
Desor, E.
Dorr, B.
Durand, E.
Elwyn, A. L.
Emerson, Geo.
Encke, J. F.
Faraday, M.
Farnham, J. W.
Field, H. W.
Fisher, S. G.
Fraley, F.
Genth, F. A.
Gross, S. D.
Haidinger, W.
Harris, R. P.
Hayden, F. V.
Heer, O.
Henderson, A. A.
Herschel, J. F. W.
Hill, T.
Hitchcock, E.
Hofmann, A. W.
Humboldt, A.
Hunt, T. S.
Hyrtl, J.
Jackson, J.
Jackson, R. M. S.
Jäger, G.
Kneass, S.
Koninck, L. de
Lea, I.
Le Conte, J. L.
Lepsius, R.
Lesley, J. P.
Lesquereux, L.
Logan, W. E.
Lombardini, E.
Loomis, E.
Miller, E.
Moore, S.
Morlot, A.
Morse, S. F. B.
Ord, S.
Peale, F.
Pennington, J.
Price, E. K.
Quetelet, A.
Quincey, J.
Rand, B. H.
Roberts, S. W.
Robinson, M.
Roehrig, F. L. O.
Rokitansky, C.
Sharswood, G.
Silliman, B.
Smith, F. S.
Stephens, W. B.
Swift, J. G.
Troyon, F.
Wilkes, C.
Wister, C. I.
West, F.